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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Dairying Industry—Its Development and Value.

INVITING His Excellency the Governor (Sir Leslie Wilson) to formally open the annual exhibition of the Queensland Butter and Cheese Factory Managers' and Secretaries' Association, the president (Mr. J. J. Searl) said that the association of factory managers represented an income derived from butter and cheese that amounted approximately to £6,000,000 a year. Over 60 per cent. of this butter and cheese was shipped to a market in London, and much of it was not consumed till four or five months after it had been made. Queensland therefore was called upon to manufacture butter and cheese that had good keeping qualities. For that reason an exhibition was staged annually that would give the factory managers some idea of how the product turned out after it had been stored for some time.

His Excellency said that was the first show he had opened that had anything to do with the primary industries of the State, but he intended to tour Queensland to see these industries for himself. He congratulated those who had organised a show of such great importance. In primary products the first essential was quality—after quality usually came quantity. That the butter produced in Queensland was of the highest standard was proved at the recent Royal Agricultural Show at Islington, where Queensland butter obtained the highest possible award.

He would like to mention one extraordinary fact—in the year 1900 only 9,000,000 lb. of butter was manufactured in Queensland, whereas to-day 100,000,000 lb. was produced, showing the enormous growth and progress of the industry. This

100,000,000 lb. was produced by 24,000 dairy farmers, supplying 117 of the factories throughout Queensland. These factories were as up to date as could be found anywhere in the world, and some of them produced 100 tons of butter a week. An amazing feature was the immense increase in export during the past year. That was entirely satisfactory. He hoped the industry would continue to prosper, and he was sure that an exhibition such as they had seen at Hamilton would help towards that end.

Further Research Work Planned.

AT the same gathering the Minister for Agriculture (Mr. F. W. Bulcock) said that as head of the Department he realised that there were avenues yet to be exploited. Along certain lines the Department should be entirely at the disposal of the people engaged in the primary industries. Attention must be given to the necessity for technical research. It would be his endeavour to make available to those who were creating material wealth facilities for research for the benefit of the dairyman, the butter factory manager, and the cheese producer, and others engaged in the industry.

He gave those assembled the assurance that as far as the Department could help in the solving of problems it would do so. He hoped to proceed with herd testing, with experiments in the top-dressing of pastures, and with problems connected with the incidence of disease. It was his intention to set up an organisation that would inquire more closely into problems concerning dairymen; he also intended to reconstruct the Yeerongpilly Stock Experiment Station as a research laboratory available to the dairymen of Queensland.

Avoidable Losses in Dairying.

AMONG the several important papers read at the June conference of butter and cheese manufacturers was one prepared by Mr. W. S. Hartley, manager of the South Burnett Co-operative Dairy Association. His subject was "Avoidable Losses in the Dairy Industry," in the course of which Mr. Hartley said he wished to draw attention to facts, some of which might prove unpalatable, but nothing was to be gained and much might be lost by an unfounded optimism, which overlooked their existence.

It was heartening to record that steady progress was maintained by dairymen in improving the breed and capacity of Queensland's dairy cattle, he said. A better system of herd-testing would be of service to farmers, and do much to eliminate losses due to milking cows, whose exact productive capacity, stated in monetary terms, was not known.

"If it be true that onlookers see most of the game," he went on, "then I am entitled to say that the future prevention of the huge losses, usually sustained by farm and factory when a man-size drought hits Queensland, will be secured by subdivision of paddocks, pasture improvement, and above and beyond all huge reserves of pit silage and hay. Surplus grass is plentiful at recurrent periods of the year, and pit silos are both cheap and effective for its storage in a palatable and succulent form. To take another point of view, it should not be an impossible task for Government to devise a 'drought insurance scheme,' with proper safeguards in the way of fodder reserves on the farms of component members."

Mr. Hartley covered a wide field, which included losses due to transport, low-test cream, and quality, the reduction in the price of boxes, moisture control, oil reclamation, and dual grading.

Feeding Value of Dairy By-products.

AT the same assembly Mr. H. J. H. Hines (Agricultural Chemist at the Queensland University), in a paper dealing with the feeding value of dairy by-products, pointed out that in some industries the value of by-products was sufficient to turn certain loss into handsome profit. The main uses to which dairy by-products were put were in the rearing of calves, pigs, and poultry, and in the feeding of fowls for egg production. The poultry industry in Queensland offered a promising field for the extended use of dairy by-products. Considerable changes as the result of experiments were likely to occur in the methods of feeding practised. The commonly used bran, pollard, and grain mixtures provided too little protein in the early stages of bird growth; properly supplemented by protein-rich foods, growing mashes could be designed to give remarkable growth in a short period. Giving details of experiments carried out at the Mount Gravatt experiment station, Mr. Hines said that White Leghorn chicks raised under a specified ration had an average weight in eight weeks of 20½ oz., as against 15½ oz. under another ration. Australorp chicks had a weight of 25½ oz., produced at a cost of 4d., under an approved ration. The young chick required a ration containing in the neighbourhood of 20 per cent. of crude protein. A substantial portion of the protein-rich supplements should consist of dairy by-products, such as skim milk, dried skim milk, or buttermilk. Eggs in their composition compared closely with milk, and milk by-products might therefore safely be held to be valuable aids to egg production. In the ticklish business of the early weaning of calves to save milk, extensive use was now being made both in Great Britain and New Zealand of whey paste—whey evaporated to a semi-solid consistency. Dr. Harding, in the journal of the Ministry of Agriculture in England, was enthusiastic in his praise of this product. Pigs had long been a standby in the disposal of surplus products; the Brisbane abattoir held promise of improvement in storage and transport, and continued attention to the problem of feeding might serve to combat low prices by lowering production costs. A growing demand might reasonably be expected for dairy by-products; a factor militating against their more extensive use was their high cost, which possibly might be reduced as demand grew and processes improved technically.

Advice to Tobacco Growers.

ENTIRE eradication of tobacco plants on completion of harvesting of the leaf and seed is advised by the Minister for Agriculture and Stock (Mr. Frank W. Bulcock). In the course of a recent statement on the subject he said that the harvesting of the 1931-32 tobacco crop had now been practically completed, and it was essential that the plants from which leaf had been gathered should be uprooted at once and wherever practicable destroyed by burning. In the course of the past season the entomological and plant pathological staff of the Department had devoted considerable attention to tobacco pests and diseases, and it was obvious from the information obtained that the incidence of these troubles would be reduced appreciably if the advice given were accepted by the growers and put into immediate practice.

Mr. Bulcock added that the destruction of the remains of the present crop and also of any volunteer plants would reduce to a minimum the material on which the various pests and diseases could continue their existence until the beginning of next season. This meant that the next season's crop would obtain a reasonably clean start, whereas the neglect of the precaution of destroying the residue of the crop would greatly increase the risk of infestation at the outset of the next season.

By Courtesy of the "Daily Mail," Brisbane.]

PLATE 1.—THE NEW QUEENSLAND CABINET.

From left to right: Hon. John Dash (Minister for Transport); Hon. H. A. Bruce (Minister for Works); Hon. E. M. Hanlon (Home Secretary;) Hon. Percy Pease (Minister for Lands); Hon. W. Forgan Smith (Premier. Chief Secretary, and Treasurer); His Excellency the Governor, Sir Leslie Orme Wilson; Hon. John Mullan (Attorney-General); Hon. Frank W. Bulcock (Minister for Agriculture and Stock); Hon. M. P. Hynes (Minister for Labour and Industry); Hon. F. A. Cooper (Minister for Public Instruction); and Hon. James Stopford (Minister for Mines).

Standing: Mr. G. W. Watson (Clerk of the Executive Council).

The Minister's Message.

TO THE FARMERS OF QUEENSLAND.

The services of the Department of Agriculture and Stock are at the disposal of the farmers and stock-owners of Queensland, and a completely successful outcome of departmental effort can only be possible with the continued co-operation of all concerned.

I would like you all to recognise that the Department is your Department, and that its policy is shaped in consonance with your individual requirements and the needs of organised agriculture based on science.

It is realised that the efficiency of methods of crop disposal must rest largely in the producers' own hands, and our desire is to perfect the comprehensive rural policy initiated some years ago for the benefit of Queensland producers.

We all recognise the complexity of modern marketing machinery and that our selling system must fail unless the many problems of distribution are studied and solved. We believe that the need of patient attention to the effectiveness of every link in the chain from the producer to the consumer has, in present world circumstances, vastly increased. We also acknowledge the necessity of a radical improvement in the organisation and distribution of agricultural produce in the interests of the State, no less than in the interests of the individual farmer.

It is my belief that the progress and prosperity of Queensland are bound up with the primary industries, so every effort will be made to promote their welfare.

I am fully aware of the difficulties in the way of the fulfilment of the desire to make an effective contribution towards the solution of the very grave problems confronting the farmers and stock-raisers of Queensland and, in extending sincere greetings to you all, I ask for your earnest and hearty co-operation in the performance of the task that lies before me.

Frank. W. Bulcock

Bureau of Sugar Experiment Stations.

HINTS TO CANEGROWERS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Entomological Notes for July, from the Northern Entomologist (Mr. E. Jarvis), Meringa:—

IMPORTANT NOTES ON GRUB FUMIGATION.

It is encouraging to record that during the cane beetle season just passed (December, 1931, to May, 1932) many of our growers have shown practical interest in the work of fumigating grub-infested cane land; which for the most part has been carried out in accordance with our directions as to the correct procedure for this method of grub control, the results obtained having again amply demonstrated the value of such treatment. In a few instances, however, farmers have met with disappointment, owing probably to the injecting having been undertaken too early in the year, before termination of the period occupied by emergences of these cockchafers.

When scouting for grubs and chancing to find a number of small ones under each stool examined, a grower would naturally become alarmed, and in his desire to destroy the pest without delay, be apt to overlook the fact that grubs of the first instar of growth do not materially damage the cane until about four weeks later, after they have moulted into the second stage of development.

During this interval any eggs deposited by secondary emergences of greybacks will have had time to hatch out, and these resultant grubs can be finally destroyed when fumigating the cane against those of the second and third instars.

CUT THE FOLLOWING TABLE FROM YOUR JOURNAL AND KEEP FOR FUTURE REFERENCE.

EARLY STAGES OF CANE BEETLE; WHEN TO FUMIGATE THE STOOLS.

		Days.
19 Nov. ..	Assumed date of emergence of beetles.	
20 Nov. ..	Beetles, after copulation fly to the feeding-trees; remaining on same for about two weeks	14
3 Dec. ..	Egg-laden beetles invade cane land to oviposit under stools.	
15 Dec. ..	Grubs of the first instar or stage of growth are hatched out and commence feeding	12
	Period of first stage grub lasts about 30 days. Width across head of grub $\frac{1}{8}$ in. Length of body (doubled up state) from $\frac{1}{4}$ to $\frac{1}{2}$ in.	30
14 Jan. ..	Appearance of grubs of second instar, which lasts about 38 days. Width across head of grub is $\frac{1}{4}$ in. Length of body (doubled up state) $\frac{5}{8}$ in. to $1\frac{1}{8}$ in. About two weeks later these grubs of second stage, when numerous under the stools, do damage to the roots. Scouting of grub-infested fields can now be undertaken and fumigation work may be carried out at any convenient time between the dates of 28th January to about middle of March	38
21 Feb. ..	Appearance of grubs of the third stage of development. The duration of this instar lasts approximately 16 weeks (21st Feb. to 11th June). Width of head of grub $\frac{3}{8}$ in. Length of body (doubled-up form) $1\frac{1}{4}$ to $1\frac{1}{2}$ in.	112
		206

A period of about seventy days should elapse from laying of the eggs until starting fumigation work, but in the event of there being a secondary emergence of beetles this period would need to be extended to about 100 days, in order to catch the grubs from both emergences.

Duration underground of the egg and larval conditions of this beetle (*Lepidoderma albohirtum* Waterh.) occupies a period of about 206 days.

The complete life-cycle of a greyback cockchafer (from egg to adult beetle) is completed in one year.

Note.—The figures shown below refer to years in which *single emergences* take place. This generally happens when dry weather conditions prevent flighting of the beetles until the end of November or middle of December.

WHEN TO FUMIGATE GRUB-INFESTED CANE LAND.

Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.
20 Nov.	29 Jan.	5 Dec.	13 Feb.	19 Dec.	27 Feb.
21 Nov.	30 Jan.	6 Dec.	14 Feb.	20 Dec.	28 Feb.
22 Nov.	31 Jan.	7 Dec.	15 Feb.	21 Dec.	1 Mar.
23 Nov.	1 Feb.	8 Dec.	16 Feb.	22 Dec.	2 Mar.
24 Nov.	2 Feb.	9 Dec.	17 Feb.	23 Dec.	3 Mar.
25 Nov.	3 Feb.	10 Dec.	18 Feb.	24 Dec.	4 Mar.
26 Nov.	4 Feb.	11 Dec.	19 Feb.	25 Dec.	5 Mar.
27 Nov.	5 Feb.	12 Dec.	20 Feb.	26 Dec.	6 Mar.
28 Nov.	6 Feb.	13 Dec.	21 Feb.	27 Dec.	7 Mar.
29 Nov.	7 Feb.	14 Dec.	22 Feb.	28 Dec.	8 Mar.
30 Nov.	8 Feb.	15 Dec.	23 Feb.	29 Dec.	9 Mar.
1 Dec.	9 Feb.	16 Dec.	24 Feb.	30 Dec.	10 Mar.
2 Dec.	10 Feb.	17 Dec.	25 Feb.	31 Dec.	11 Mar.
3 Dec.	11 Feb.	18 Dec.	26 Feb.		
4 Dec.	12 Feb.				

How Canegrowers Should Act.

In the first place all farmers purchasing soil fumigants should get into touch with the Entomologist at Meringa. When commencing fumigation work, remember that a 'phone call will bring an officer to the field to be treated, to demonstrate how to manipulate the pump and keep it in good working order, and to supply any information needed regarding the amount of the dose required for the crop in question, and what depths and distances from stools it should be placed.

Cane farmers would also find it advantageous to record in a note book or diary the dates on which primary and secondary emergences of greyback beetles were first observed to be on the wing. The purchase of insecticides is a wise step for any farmer to take; but at the same time, by being too hasty to apply same, it is possible to suffer the loss of both cane and fumigant.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, states that the preliminary estimate furnished by the Queensland sugar mills, of the cane to be harvested during the 1932 crushing season, shows that 3,667,568 tons are likely to be crushed. This would give a yield of 94 net titre sugar in the region of 524,000 tons, which will be about 57,000 tons less than manufactured last year. The principal falling off is in the districts from Bundaberg south.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

PART XXVIII.

Field Machinery—(B) Cane Harvesters.

MANY attempts have been made in Australia to invent and perfect a machine that would successfully cut cane. Although I have been unable to find any reference to cane harvesters in the early literature connected with sugar-growing, yet probably attention was given to this subject even in the early days of cane cultivation. I have been connected with the industry for upwards of thirty-four years and during the whole of that time I have seen or heard of many machines devised for cane cutting, from automatic air-driven chisels and gigantic scissors operated by hand, to the powerful machine known as the Falkiner Cane Harvester, now stated to be working in Cuba, but which was invented in Australia. The cost of canecutting is so high, and the manual labour involved in hand cutting is so great, that the subject has always had a fascination for many persons with a mechanical turn of mind.

It is only during recent years, however, that there has been any promise of success, and we do now appear to be getting closer to the desired achievement of cutting cane by machinery.

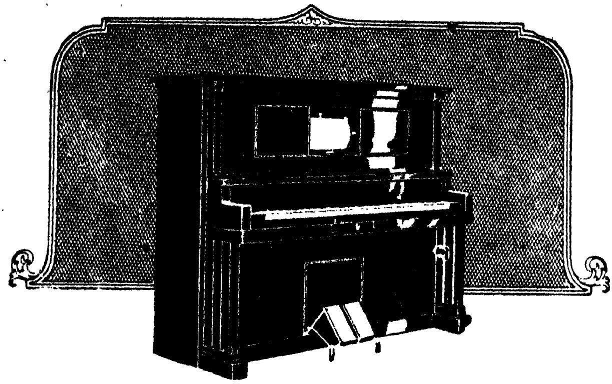
The earliest reference I have found to a mechanical cane cutter appears in the Report of a Royal Commission on the Sugar Industry in 1889. It is there said:—

> "T. A. Silverwood presented a model of a practical apparatus for cutting standing cane. The *modus operandi* of the cane cutter were fully explained. The members of the Planters' Association (at Bundaberg) were so favourably impressed that they promised the inventor monetary assistance to enable him to have a full size working machine made."

Nothing further appeared in connection with the machine that I have been able to trace and, like the majority of its followers, it sank into obscurity.

In 1892 a prize of twenty shillings was offered by the Agricultural and Pastoral Society at Bundaberg for a cane harvester to be locally made. A writer then remarked that if the Association had made the prize £50 it would not be claimed, but if it were, Bundaberg would have nursed into existence the most valuable invention yet discovered in connection with the sugar industry. He went on to say:—

> ". . . Several inventive men in this district are cudgelling their brains over this difficult piece of machinery. At least six different designs are being worked out. At the Bundaberg foundry there are several models, and at the same place there is one complete machine, the invention of Mr. Rowland, proprietor of the "Star" and Mayor of the town. It seems to me that every design seems to fail at the point of cutting. A Brisbane engineer some years ago made a machine that would very nearly work. If a few small alterations had been made, success would probably have attended his efforts. He was a designer and not a workshop man, and I heard he went home to Scotland to remedy his deficiencies. That a harvester, able to work on level ground, will be invented is almost a certainty."



The next reference to cane cutting by machinery is in 1893, where the "Mackay Sugar Journal" states:—

> "Mr. Joseph Fletcher, F.C.S., forwards us plans of his proposed cane-cutting machine recently patented in Queensland.
>
> "The machine is an adaptation of the principles of the ordinary reaping machine to the cutting of sugar-cane, with such modifications as fitted for that purpose. The motion is derived from a driving wheel in contact with the ground revolving as drawn by a team of horses, oxen, or in the larger machines by a steam engine. . . . This cutter is of peculiar construction, being a saw made of small pieces, jointed, or loosely riveted together in such a way that the cutting edge is always presented to the standing cane whilst it revolves round spindles at a very rapid rate. The construction of this saw-cutter permits of very easy repairs.
>
> "The simple machine, consisting of framework, driving wheel, and cutter, could be constructed for a small sum and would be sufficient for farmers growing a few acres of cane; a pair of horses would be enough to work it, and the amount of cane cut would be large. A larger and more ambitious machine provides that when the cane is cut by a similar means it should fall on an arrangement of light wire ropes having at intervals teeth or prongs which collect and elevate the canes and the guides to another platform, at one end of which is a system of revolving knives by which the tops of the canes are cut off to fall behind the machine, this cane being delivered at the side in rows or on to a wagon which may accompany the machine. This arrangement of knives is capable of adjustment (within moderate limits) to the average length of the cane in the field, but short canes must fall out uncut, to be topped by a man following the machine.
>
> "With a stationary steam engine, wire-cables, &c., a very large quantity of cane should be harvested in a day, and the saving of labour should be considerable. The cost of such a machine, if it were successful, would be amply repaid by one season's working."

This machine which promised so much has certain points of resemblance to some of the later cane cutters recently tried out, but it too was no more heard of.

The subject again crops up in the "Mackay Sugar Journal" later in the same year, when it is said:—

> "We are in receipt of a letter from a gentleman in Sydney who is anxious to dispose of his interests in a machine to cut cane. It is worked by two horses and one man and moves at the rate of 2½ miles per hour, will cut 20 acres of cane a day at a cost of less than one penny per ton."

Where was this machine in some cane cutters' strike? The sugar-growers could all have been "sugar barons" if they had a machine to cut 20 acres a day at a penny per ton!

In 1894 we read that the Queensland Registrar of Patents had accepted an application for letters patent for a "sugar-cane cutter."

In the same year Mr. C. W. Bock, of Bundaberg, patented a machine to be used in the fields for canecutting. By a system of cogs, movement

was given to a horizontal cross-saw. Another action shot the untopped canes over the roof of the machine, leaving same lying in rows upon the ground behind. Persons interested in the sugar industry expressed the general opinion that for practical purposes the invention was superior to any yet tested. This cutter was improved during the following year.

An improved machine for canecutting was patented and tried in the Bundaberg district by Mr. Corten also in 1894. A report stated that it seemed to come nearer to what is required, but funds were wanted to build the machine and test its capability.

Stepping out of Australia, in 1894 we learn that a new cane cutter had been invented in Louisiana by a Mr. A. le Blanc, which presented some new points that promised success in the direction whereon most machines had failed so far.

> "The new machine was to be propelled by mule power from behind and to cut the cane at or slightly below ground level. The cane thus cut falls on a carrier and passes over a drum, cut end foremost. As the cane drops from the drum a rapidly revolving knife cuts off the top of each cane stick just as it drops. Thus the short and long canes are all properly topped, as the topping is only done when the cane passes off the carrier and the top end falls across the topping knife. It has seemed that human discretion was esential to determine when to cut off the cane at the top. Now we have a rapidly revolving knife that will top any cane that falls across it, but while short canes may fall across the knife when the carrier carries them, 4 feet or 5 feet long cane cannot fall across the knife until the carrier has carried them their full length, when they, too, fall across the knife and are properly topped."

The year 1894 seemed a rather fruitful one for different machines. In 1895 the only reference I find is the following:—

> "Some months ago, it will be remembered, an account appeared in the columns of the "Bundaberg Mail" of a cane cutter designed and patented by Mr. C. Bock, sen., of Burnett street. Before any practical use was made of the invention, a topper was added, and it was found necessary to make material alterations to the original cutter with the view of enabling it to work closer to the ground. In fact, the whole construction was so altered as to practically constitute an entirely new machine. Application was then made, through Mr. H. N. Thorburn, for letters patent, which were received upon Saturday last, when a representative of this paper waited upon the inventor and obtained the following particulars.
>
> "The salient features of both cutter and topper are that they are automatical in movement and so designed as to be capable of being drawn by one or two horses from either end. The cutter consists of a large wooden framework fixed between two bulky wheels to the connecting shaft to which is attached the various portions of the machinery. The framework is divided into two parts, one of which is for dealing with the cane, and the other contains the cog-wheel gear. The former is flanked by high iron sides to prevent the cane, when cut, interfering with the gear. Projecting from the frame, fore and aft, are sets

of two gatherers so placed as to be capable of picking up any fallen sticks; and below there is a lacerated knife, which, working sideways, cuts the stools close to the ground. The forward motion of the machine makes the cane fall back upon a platform on which are two revolving drums. These shoot the cane along until it is in position against the swing board of the topper. The cog-wheel or driving gear consists of a shaft on which is a cog-wheel driving a smaller one 'keyed' to a crank shaft with two eccentric rods. These drive a pulley shaft which connects by belting with the lacerated knife. The topper, a separate piece of machinery, is placed at the end of the cane platform. When the cane has been driven by the rotary motion of the drums on to the swing board of the topper, a cam or eccentric driven by the topper's shaft tilts the swing board up. As the swing board is tilted a gauge board rises to prevent the cane from dropping too far. This board can be regulated from 14 inches to 2 feet, so as to cut off the whole or only part of the tops. When the latter are severed the guillotine rises and the gauge board drops again, thus allowing the cane to slide from the swing board to the ground. The cutter and topper together, it is calculated, will not weigh more than 12 cwt. They are to be exhibited at the forthcoming show, and, meantime, Mr. Bock will be glad to show them to anyone calling at his residence."

Nothing further appears in the "Mackay Sugar Journal" till July, 1897, when a leading article deals with the matter asking whether it was not possible to find a light portable motive power which, operating along flexible shafts, would enable several men to cut and top cane without the necessity of striking a blow themselves.

(The writer must have had in mind the mechanical sheep shearing, but he does not explain how the motive power and flexible shafting are to be moved from place to place in the field.)

The writer adds the need is urgent, but regrets that the bare idea of finding any machine which would operate with almost human intelligence in the cutting of cane was always the signal for derision, laughter, and scorn.

In the year 1900 a description is given of a new cane cutting machine invented in Louisiana. This presented some novel ideas.

The machine resembled the usual two-wheeled vehicle drawn by three mules, except that no middle mule was used in the shafts—

"but the machine is guided by the two mules outside of the shafts. This leaves the space usually occupied by the middle mule for the standing cane just before being cut. In other words, one mule and one cart wheel goes on one side of the cane row, and the other mule and cart wheel goes on the opposite side of the cane row. There are also two other mules that push the cart from behind. The axletree is curved up in the middle, to allow the canes to pass under just as they are cut and fall forward. The cutting of the canes is accomplished by two steel discs placed underneath the axletree of the machine. These discs revolve horizontally, and are attached to the journals, which are adjusted at the desired height. The discs below the axletree above and the two sides of the frame, form a rectangular opening, or throat, through which the canes pass, root ends backwards, as the machine advances forward. It is proposed to make future machines with each disc 3 feet in diameter. The edges of the discs lap 2 inches.

This would leave some 30 inches space between the journals of the discs. It is considered that this 30-inch space, or throat, will be wide enough to allow a heavy growth of cane to pass through just as it is cut and is falling forward to the ground. The discs are partly in the ground, at the roots of the cane, and I did not observe that any canes were cut in two near the middle by falling forward on to the ground before the discs had passed on out of the way. The lower ends of the cane just cut are steadied by some soil clinging to the roots, and the tops of such canes fall forward against standing canes just to be cut.''

These are all the references to cane cutters in the ''Mackay Sugar Journal'' from 1892 to 1900. No doubt many other devices were patented which never saw the light or got outside the ''plan and specification'' stage.

In the Annual Report of the Bureau of Sugar Experiment Stations for 1903, reference is made to a cane cutting machine in the following terms:—

> ''The invention of a mechanical means of cutting cane, as a substitute for hand cutting, has engaged the attention of several inventors for some time.
>
> ''A cane cutting apparatus has been made by Mr. Herbert Paul and a public trial was made with the machine on 17th October of this year at the Mackay Sugar Experiment Station. . . . . . This mechanically is a partial substitute for hand labour. The question of the relative economy of the device has yet to be determined. This will be done during next season by comparative tests of cost of cutting by machine and by hand.''

From what I remember of this machine it was in the form of a sharp automatic chisel strapped to the cutter's arm and operated by compressed air, making a series of rapid blows when applied to the cane and cutting through the stick. From memory I think it did not work as quickly as a good cane cutter did in the same block. Anyhow, it was never more heard of.

On a previous page it was mentioned that Mr. Rowland, of the ''Star'' newspaper in Bundaberg, invented a cane cutter. It is rather a curious coincidence that about ten years later Mr. T. D. Chataway, proprietor of the ''Mackay Mercury'' and also Mayor of Mackay, designed a cane cutter, but I do not think it ever got beyond the ''plan'' stage.

Another remarkable invention was that of a Mr. Alfred Cantle, at Yandina, in 1909. This was a machine which he asserted would solve the problem of the cheap and rapid cutting of the cane crop. It was a hand machine operated and propelled by one man, and weighed about 28 lb. It had at the foot a triangular knife similar in shape to the cutting tooth of the ordinary scarifier. This was carried on a light iron frame supported at the rear by a pair of light iron wheels, and it slides along the ground on the under surface of the knife. It was propelled by means of handles like a wheel barrow. When the knife had been brought in contact with a cane stool the operator lifts a cross-handled lever which raises a swinging hammer. The latter, on being released, strikes violently against the projecting shaft of the cutter and drives it through the object to be cut. This movement is intensified by the action of a spring in contact with the handle. It was claimed that the blow can be so delivered as to cut through many sticks of cane at a stroke,

and that one man with the machine could do as much work as three without it. Another feature of the machine was that the tapping could be very simply done by resting the handles on the ground so that the knife was elevated to a convenient height for the operator who, seizing the cane stalks severs the top by simply striking them against the sharp blade of the knife. These ideas also perished.

During the first few years of the present century we did not hear very much about cane harvesters. After the one mentioned in 1903 no further reference is made in the Annual Reports of the Bureau of Sugar Experiment Stations till 1925. There were, however, some attempts made to cut cane by machinery between the years mentioned, and in addition a number of inquiries were made by inventors. It was rather a curious thing that nearly every one seeking information as to the prospects of success of a cane cutter were imbued with the erroneous idea that there was a huge reward offered by the Queensland Government for a successful cane cutter, the sums of £10,000 to £100,000 being generally mentioned.

A machine known as the Hurrey Cane Harvester was being experimented with about 1910. The inventor devoted much time and money to the work and it was this machine, afterwards taken over by Mr. Falkiner, that became the basis of what is now known as the Falkiner Cane Harvester of which reports have recently come from Florida and Cuba.

In August, 1921, a demonstration sponsored by the Australian Sugar Producers' Association took place at Sarina (Plane Creek), when the son of the inventor who had previously died was in charge of the machine. He stated that the machine then being tried was built on very different lines to the original machine. Mr. Hurrey said it was designed to do all the work with one man, but the mechanism had not operated as it should, the topping gear would have to be altered and the guillotine strengthened. The machine could now cut 3 acres daily, but would cut 4 acres when properly geared. The defects would be remedied, and by the end of the season he was sure he would have a satisfactory cane cutting machine.

The Luce Cane Harvester.

This machine came into a great deal of prominence from 1914 to 1929, but recently nothing has been heard of it. It was pictured very freely in the current Sugar Journals of the time, and a moving picture film of the machine cutting cane was sent to the Australian Sugar Producers' Association and exhibited at one of their conferences a few years ago. This machine, I understand, was a Louisiana invention, but it was also tried in Cuba. The Commonwealth Government was invited to send an Australian sugar planter to inspect the machine working, but this was not done. The Luce Cane Harvester Company said in their letter to the Secretary of the Prime Minister, that their idea was to ultimately arrange for the manufacture of their harvester in Australia, but before doing that it would be necessary to try out an imported machine under Australian conditions and so create the demand necessary to justify the erection of a local factory, but the great expense that would be incurred rather put that out of the question for the time being.

Good reports of the work done by the harvester in Cuba and Louisiana were received from time to time, and it is difficult to understand why no further reference to it have appeared lately. The plates following show the Luce Cane Harvester.

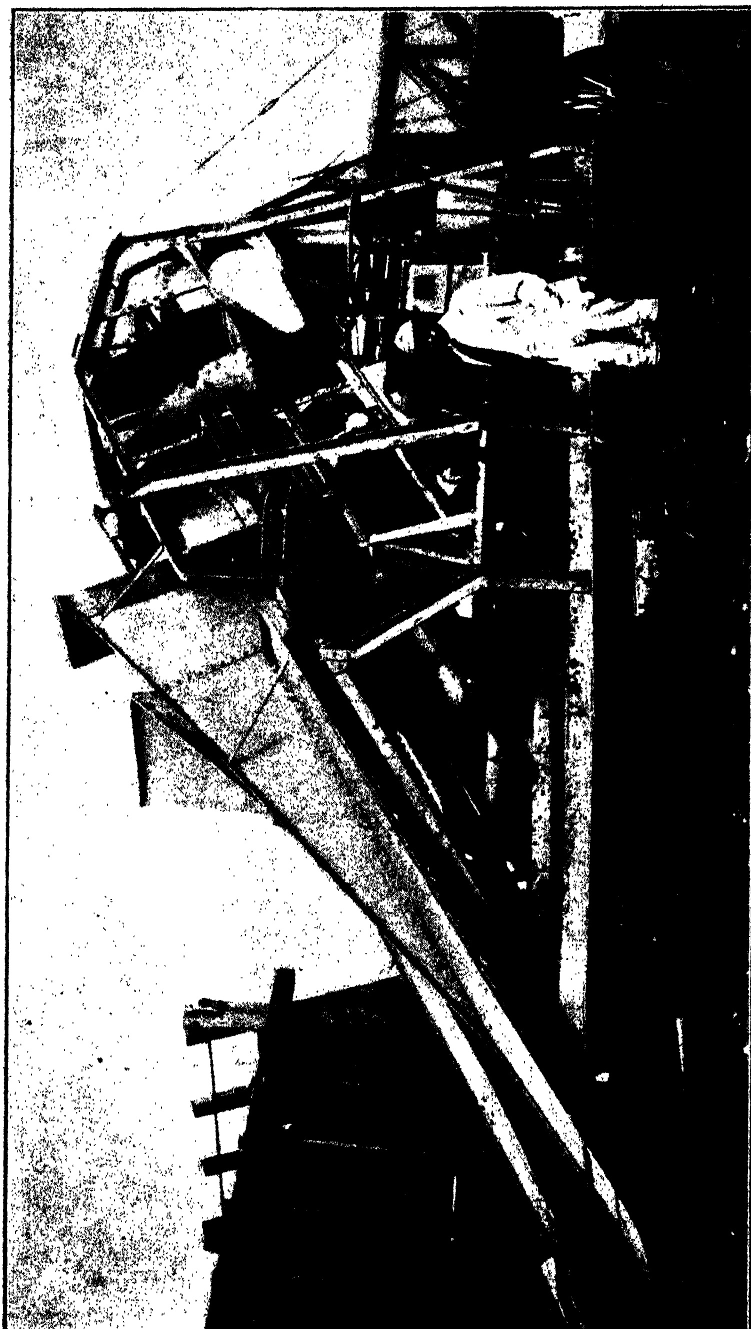


PLATE 2.—SHOWING THE CONSTRUCTION OF THE LUCE SUGAR CANE HARVESTER.

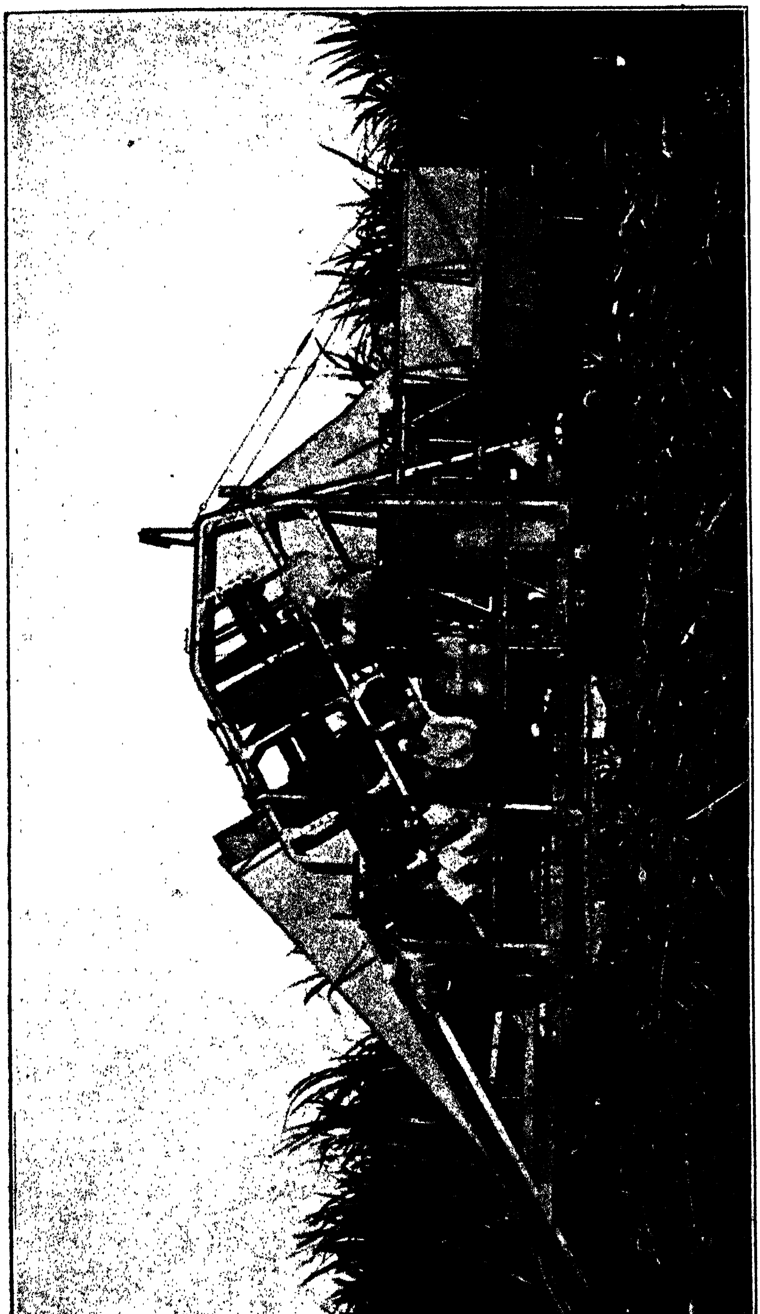


PLATE 3.—ANOTHER PICTURE SHOWING THE CONSTRUCTION OF THE LUCE SUGAR CANE HARVESTER.

Haorgt's Cane Harvester.

In 1923 Mr. W. G. Haorgt informed the Queensland Council of Agriculture that he had invented a cane harvester. It had been tried at Beenleigh, but there were several improvements needed which had been overcome and the patterns were now all ready to make the new machine. Extra capital was required to build it, and he desired the aid of cane-growers and Government support. His machine would cut the cane ½ to ¾ inches below the ground, then it threw the cane on to a moveable carrier which carried it up a working platform to a workman who guided the sticks to the knives to be topped at the required length, and then it was carried by a rotary carrier into a stripping-box which strips it and leaves it ready for carting to the rollers and deposited on a trailer. It is designed so that it can be built on a 3½ ton chassis with a 30 to 35 h.p. engine, and such power would be more than enough to take it through any fields.

In 1928 a cane harvester called the Fisher was mentioned (the result of eight years' investigation and trials) and made its first demonstration in America. The machine operated for forty days in the cane fields and was tested severely in every way. As a result certain improvements were to be introduced tending to reduce weight, strengthen the structure, and add to its mobility. The completed machine would be operated by three men and should handle 300 to 500 tons of cane a day at an estimated cost of 2½d. per ton of topped, cut, stripped, and loaded cane. This, I suppose, was also too good to be true, as nothing further has come to light.

Another American invention was mentioned in the press during 1930; this was a cane cutter invented by Carl G. Muench, of New Orleans. It is thus described:—

> "Ripping its way through tall fields of cane in both Louisiana and the new sugar plantations in the Florida Everglades, the sugar-cane harvester cuts the cane and strips it clean of leaves at the rate of 20 tons an hour, equalling the work of 159 skilled field hands. So successful were the operations of two of these machines this year that four more are now under construction and will be ready for next year's harvesting.
>
> "Because it will work twenty-four hours a day, while the field hand cannot work more than ten hours, the new harvesters actually more than replace the work of 300 men per day.
>
> "The perfection of the cane harvester ends half a century of failures on the part of sugarmen to build machines that will cut the tough cane stalk, strip off the foliage, and leave the stalk ready for the sugar grinding mill."

Howcroft's Cane Harvester.

This was a Queensland invention built before the war, but as far as I can gather it was never operated. In 1923 the inventor called on the Director of Sugar Experiment Stations and showed him a photograph of the original machine which he stated was not then in existence. He had made or thought of many improvements. The inventor wanted the Government to make him an advance in order that the new machine could be built. The Government declined the risk and nothing further was heard of the machine.

In the next article the more modern types of cane harvesters that are now in course of trial will be dealt with.

[TO BE CONTINUED.]

SOILS AND SUGAR CANE CULTURE.—I.

FORMATION AND COMPOSITION.

By H. W. KERR.*

IN its broad meaning soil is that friable upper layer of the earth composed for the most part of mineral matter resulting from the breaking up and decay of rocks. It is thus the product of rock weathering, brought about by the action of the destructive forces of nature. These forces include the stresses set up in the rock mass due to alternate heating and cooling and the action of running water as an abrasive agent, assisted by the sand and gravel which it carries along. In cooler regions the water which enters the cracks of the rock may become frozen, and the force exerted in this way tends further to open up the cracks and hasten the break-down of the rock. Under humid tropical conditions the rock decay is effected chiefly by the chemical action of water, aided by gases such as oxygen and carbonic acid which it carries in solution. The products of decay of vegetation are frequently acid substances which also exert a solvent influence.

As a result of this complex, slow action, the solid rock mass is eventually reduced to small particles, and the minerals of the rock undergo a greater or lesser change in the process. The quartz particles are merely broken down to smaller sand grains, but other minerals may completely lose their identity in the process. An outstanding example of rock weathering is the decomposition of the hard, dark, compact volcanic rock or basalt which occurs at numerous points along the coastal area of Queensland. It yields a deep, rich red or chocolate loam such as is found at Bundaberg, Childers, Innisfail, and Atherton. In many cases the rock has been changed to soil to a depth of 100 feet or more. The weathering processes do not cease when the soil is formed, but continue to act indefinitely upon the soil itself. As we shall see later, this is most important, for the process provides a supply of materials most valuable to our crops.

In many localities, we may trace the changes from the mature surface soil, through the partially decomposed rock, to the solid, unchanged material. Such a soil is known as a residual soil, and is directly related to the underlying rock. The red volcanic loams provide an example of this type. However, the excessive rainfall which drains from the land surface during the wet season, carries with it a greater or lesser amount of fine soil material which may find its way into creeks and rivers. In times of flood these streams frequently overflow their banks. The rate of flow of the water is thus checked, and the load of sediment is deposited as a layer over the flooded land surface. In this way soils are built up which have no relationship to the underlying rock. These are known as transported soils, and are represented by our river alluvials, which constitute some of the most important sugar soils of the State. The sources of the sediments are mainly the uplands drained by our coastal streams; these are frequently areas of deficient rainfall, so that the sediment has not been subjected to excessive leaching; and as a consequence it confers upon the alluvial soils a high degree of fertility, which is maintained in some measure by the renewed deposits during successive flood seasons. The rich alluvial soils of the Burdekin delta are an excellent example of transported soils of this character.

The term "soil" is also employed in a more restricted sense to designate that portion of the ground w ich is tilled, or which can be

* In a series of radio lectures from 4QG.

readily identified from the underlying stratum or "subsoil" by a definite colour change. The distinct transition from soil to subsoil may be traced very clearly in most of our forest soils, but with scrub soils there is often no sudden change, but a gradual transition extends over a depth of several feet. There is usually a definite relationship between the depth of surface soil and the fertility of the land, and it is for this reason that the deep scrub soils are preferred to the comparatively shallow forest lands.

A detailed study of the soil shows that it consists of a mixture of mineral particles of widely varying size. Let us add a portion of soil to water contained in a glass vessel, shake the suspension very thoroughly, and then allow it to stand. We would find, in general, that the coarser particles settle rapidly, and then follow the finer and finer grains, while certain of the extremely finely-divided material remains suspended almost indefinitely. The coarser particles are known as sand, while the finest material is known as clay. The grains of intermediate size are called silt. All soils contain these three grades in varying proportions, and the relative amount of each present has a most important bearing on the physical properties and the tilling qualities of the particular soil. One rich in sand is known as a sandy soil, while a soil rich in clay particles is known as a clay. Intermediate to these extremes we have the loams, which do not contain a preponderance of particles of any of these three grades.

The individual soil particles do not exist as a casual mixture in which every particle remains separate from every other particle. The finest soil material or clay exerts a cementing action which binds the soil into compound particles or granules, thus developing what is known as a "crumby" or "granular" structure. This characteristic is an essential feature of a soil in a condition of good tilth; but frequently the land loses this characteristic, so that the soil becomes loose and dusty when dry, and runs together to form a hard compact mass after wetting. This soil condition is most undesirable, and methods for correcting the difficulty will be discussed in some detail at a later stage.

So far we have considered the soil as a conglomerate lifeless mass of mineral particles. Such a mixture would be quite incapable of crop production, and we have now to recognise that the soil contains, in addition, a greater or lesser amount of material not of mineral but of organic origin. As the plant and animal inhabitants of the soil perish, their remains decompose in the soil; and the residues from this decomposition constitute that important material—the soil humus. The process of decomposition or decay which these organic remains undergo, is effected by a complex population of myriads of minute organisms known as bacteria and fungi. When we speak of bacteria and fungi, the popular mind conjures up visions of certain of these organisms in their relationship to diseases of both animals and plants; but it is well to remember that there are but few of these organisms which are actually our enemies; and, from the farmer's point of view, we must consider this great army of little workers as a never-tiring band of willing helpers who, given suitable conditions, bring about most important changes in the soil for the benefit of both farmer and crop. The plant and animal remains which are added to the soil constitute the food of these "microbes," as they are popularly called, and the by-products of their life processes are, firstly, the plant food materials which we shall consider shortly; and secondly, the undecomposed residue which remains

to confer its important properties to the soil. This material—the soil humus—is a black, waxy substance, which exists as a fine coating surrounding the mineral grains, and assists the clay particles in binding the individual grains into that crumby or granular structure so desirable in our agricultural lands. It also has an important bearing on the water-holding capacity of the land, and contributes in a large measure to its fertility.

The proportion of humus which is found in soils varies widely. In certain of the black earths of the Canadian prairies, famed for their prolific wheat productivity, as high as 20 per cent. of the weight of the soil is humus. Unfortunately, the humid tropical conditions of our coast are such as favour the rapid decomposition of the valuable soil organic matter, and it is seldom that we find more than 5 per cent. of humus in the best of our soils. The excessive leaching to which most of the sugar lands are subjected also results in a rapid loss of humus. Under intensive cultivation, the rate of loss due to these causes is intensified, and unless strenuous efforts are made to keep up the supply, by the ploughing under of all available crop residues, the soil suffers seriously from the point of view both of fertility and the ease with which it can be maintained in a condition of good tilth.

We must visualise our soil, then, as a body of lifeless, decomposed rock minerals, through which is infused the organic remains of plant and animal origin, carrying with it a busy population of microscopic life.

We have next to consider the importance of this complex mass of decayed rock and humus in its relationship to plant nutrition and crop growth.

FUNCTIONS OF THE SOIL IN PLANT NUTRITION.

Earlier students of agriculture were completely mystified by the process of crop production. That the soil was essential to plant growth was quite obvious, but of the nature of the substances which it absorbed in the process they were completely ignorant. As recently as three centuries ago it was thought that a plant was nothing more than water that had undergone a mysterious change in the soil; other workers contended that the plant roots actually fed on the solid soil particles, and the explanation of the value of cultivation was, that it helped to reduce the soil to the finest condition and thus assisted in the process of digestion by the plant. In fact, it is only during the past 100 years that the science of agricultural chemistry has given us a clear understanding of the principles of crop growth, and the true function of the soil in this regard.

Scientific studies have shown that the plant leaf is a marvellous factory in which the raw materials, carbonic acid gas and water, are manufactured into sugars, through the agency of the green colouring matter of the leaf. This substance—known as *chlorophyll*—has the power of absorbing the energy of the sun's rays, and utilising this energy to effect a combination of the raw materials. The water utilised in this process is absorbed from the soil through the roots of the plant. The carbonic acid gas, or carbon dioxide, is absorbed from the atmosphere by the inner surfaces of the plant leaves. Microscopic examination of a leaf shows that its surface is pitted with numerous small pores, through which air may enter and leave, and in this way a continuous supply of carbonic acid is maintained to the "leaf factory."

From the sugars manufactured in this way, more complex plant substances are built up. These include starches, fibre, proteins, and fats, which are essential to the economy and life processes of the plant. Our cane crop is particularly interesting in that it preserves large quantities of sugars in the storage cells of the stick, and these sugars confer upon the crop its economic value.

In addition to these organic compounds of the plant it contains, also, a certain proportion of mineral matter. This is clearly evident from the fact that when we burn the dried plant, a certain amount of ashy material remains. Analysis of the ash from a variety of plants shows that certain simple substances or elements as they are called, are always present, and it has been demonstrated that these are absolutely essential to plant growth. These essential elements, six in number, are phosphorus, potassium, calcium, magnesium, iron, and sulphur. They are usually called soil nutrients or, plant foods, and if any one of these is entirely lacking in a soil, plant growth is quite impossible; yet in total quantity they may constitute no more than 1 per cent. of the entire weight of our plant. The mineral matter of the soil is the source from which these substances are derived, and they enter the plant through the roots, dissolved in the soil water which is absorbed at the same time. It is in this respect that the weathering action in the soil is so important; it maintains the decay processes which provide these nutrients in a form available to our crops. The nutrients bound up in the undecomposed soil particles are not available for plant feeding, as was once supposed, but are utilised only when the weathering processes release them in a soluble or available condition.

There is still one essential nutrient, nitrogen, which does not arise from mineral decay, but which is entirely associated with the soil humus. It has already been stated that a mass of decomposed mineral matter will not support crop growth, for the reason that it is not capable of supplying the essential plant food, nitrogen. Further, soil nitrogen becomes available to the plant only as rapidly as the humus decays; that is, conditions in the soil must be suitable for the feeding of the soil microbes on the soil organic matter, so that they in turn may release the available nitrogen as a waste product of their feeding. At the same time certain mineral nutrients which were contained in the original plant residues, when they were returned to the soil, become available once more in the process.

The nett effect of mineral and organic decay in the soil is, then, to provide a supply of plant foods to the crop. It is also reasonable to suppose that certain soils may not be capable of supplying these plant foods in quantities adequate for the crop needs, and in this event we might expect crop growth to be handicapped as a consequence. This is, indeed, quite true, and the problem of maintaining the nutrient supply introduces the question of fertilizers and their use.

Fertilizers are used largely in Queensland, particularly by cane-growers; but there are still many farmers who have deep-rooted objections to them, which they consider as plant stimulants, the use of which will eventually ruin the land. Nothing could be further from the truth; for these substances are nothing more or less than concentrated supplies of essential plant foods. Let us look into this question a little more closely. It has already been stated that before plant growth is possible, a supply of the seven named soil nutrients is essential. Most agricultural lands contain at least four of the nutrients named; but it

frequently happens that there is a marked deficiency in the supply of nitrogen, phosphorus, and potash, and that is the reason why artificial fertilizers contain only these three nutrients.

In preparing commercial fertilizer, it is possible to mix together a variety of proportions of the constituents which supply the individual plant foods. It will be quite obvious that, if fertilizer is to be used to the best advantage, the mixture employed should be so constituted that it supplies the three plant foods in the exact proportions in which they are lacking in the soil. In other words, we may determine that our crop requires nitrogen, phosphoric acid, and potash, in certain proportions. Sugar-cane, for example, shows something like the following:—One ton of cane contains 2 lb. nitrogen, 1 lb. phosphoric acid, and 4 lb. potash. A 30-ton crop of cane will then require thirty times these amounts or 60 lb. nitrogen, 30 lb. phosphoric acid, and 120 lb. potash.

If we could only determine the capacity of the soil to yield these three nutrients, it would be an easy matter to calculate, by simple arithmetic, the weights of each plant food to be added to the soil. Unfortunately, the problem is not quite so simple as that; but the essential point is, that in seeking the most suitable fertilizer mixture, we have to keep in mind firstly, the needs of the crop, and secondly, the nature of the soil supply. The latter factor involves a knowledge of the soil itself, and it is a well-established fact that soils vary widely in their ability to supply these nutrients. In this connection take our well-known red volcanic loams. These soils are derived from a rock which is notably deficient in potash, and, as we might expect, the soil very frequently yields a deficient supply of this plant food to the crop. The use of fertilizer mixtures rich in potash on such soils is therefore attended by good success. On the other hand, the alluvial loams of the Johnstone River area are derived largely from granitic rocks, which are notably rich in potash, but deficient in phosphoric acid. On these soils our experiments show that large increases in crop yields follow the use of fertilizers rich in phosphates, while little response is shown to applications of potash. Each particular soil type, then, exhibits its own peculiar characteristics with respect to its fertilizer needs.

With regard to the nitrogen supply, it has already been pointed out that this is closely associated with the humus content of the soil; and the soils of coastal Queensland are notably deficient in their content of this important soil substance. We might expect, therefore, that these soils will frequently be found to give good results following the use of fertilizers containing this plant food. This is, indeed, a well appreciated fact; and the use of sulphate of ammonia (which supplies only the plant food, nitrogen) is a well-established practice, particularly with ratoon crops. This fact also explains in a large measure why the ploughing under of a green manure crop such as cowpea or Mauritius bean prior to planting the cane, is attended by uniformly good results. Peas and beans (which belong to the family of legumes) possess the special characteristic that they act as hosts for an interesting group of soil microbes which enter their roots, and live in a state of perfect harmony with their host. The legume supplies the sugars which constitute the food of these tiny organisms, and as they develop and multiply, they give rise to those well known nodules which are generally associated with the roots of peas and beans. In exchange for their food supply these bacteria build up a wealth of nitrogenous food of immense importance to our legume. The nitrogen utilized in the process they gather in the gaseous

condition from the atmosphere, manufacture it into compounds which nourish their host; and when the green crop is finally ploughed under, the soil receives a nett gain of valuable nitrogen compounds which, when decomposed, provide an abundant supply for the succeeding cane crop. As high as 200 lb. per acre of nitrogen may be accumulated in this way; to supply this quantity in the form of artificial manure would necessitate the addition of almost half a ton of sulphate of ammonia per acre.

The absolute necessity for the application of heavy dressings of artificial fertilizer cannot be over-emphasised if the fertility of the land is to be maintained. The weights of plant foods removed by a ton of cane are apparently quite low; yet, when it is considered that over a period of even twenty-five years, 400 tons of cane may be removed from an acre of land, we find that it would require almost 5 tons of high-grade artificial fertilizer to supply the plant food which is lost from the land in this way. Coupling this with the fact that the best of the soils of our coastal area, even in their virgin state, are not over-well supplied with plant food, due to the excessive leaching to which they are exposed, we can readily appreciate how rapidly the fertility of the land will run down when fertilizers are not employed. For a farmer to admit that a good agricultural soil becomes worn out after only fifty years of cultivation, is to make the candid confession that he has failed in his capacity as an agriculturist.

[TO BE CONTINUED.]

REPORT OF MAIZE DIPLODIA EXPERIMENTS 1930-31.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

A SERIES of experiments was designed to compare planting of clean seed with that lightly infected with Diplodia and to test the effect of treating the latter seed with Tillantin R. Experimental plots were laid down at Kairi State Farm, on Messrs. Sims and Bailey's farm at Atherton, and at Yeerongpilly. We are indebted to Messrs. Sims and Bailey and to officers of the Agricultural Branch for co-operation in carrying out the major part of the work involved, and to the officers of the Yeerongpilly Stock Experiment Station for the provision of facilities there.

Each unit of the experiment consisted of thirty-two rows 2 chains long and 4 feet apart, plus guard rows. The seed was planted singly 1 foot apart and counted to calculate the percentage germination in each row. Each row constituted a plot, there being eight randomised replications of the four following treatments:—

A. Seed with light natural infection of Diplodia.

B. Seed with light natural infection of Diplodia and treated with Tillantin R.

C. Seed from cobs carefully selected for freedom from moulds.

D. Seed from cobs tested on germinator and found free from moulds.

The results were disappointing as the crops were a failure in all except one locality, owing to exceptionally dry conditions. Figures are given for the germination in three of the trials and the yields in the one which bore a successful crop.

GERMINATON.

—		Number of Plants per Row.								
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Average.
Unit at Bailey's Atherton	A	69	74	47	58	65	51	58	46	58·5
	B	84	70	55	85	59	50	54	38	61·9
	C	69	81	70	50	74	69	60	72	68·1
	D	90	79	64	69	62	50	61	64	67·4
Unit at Sim's, Atherton	A	91	56	40	80	88	55	56	32	62·2
	B	90	65	69	86	83	55	44	55	68·4
	C	82	89	97	80	79	85	80	87	84·9
	D	79	95	83	80	83	86	85	89	85
			*					*	*	
First Unit at Yeerong-pilly	A	109	..	77	113	116	81	..	..	99·2
	B	115	..	107	118	97	72	..	..	101·8
	C	110	..	111	116	96	117	..	..	111·5
	D	110	..	117	125	113	98	..	..	112·6
			*							
Second Unit at Yeerong-pilly	A	109	..	84	115	115	105	106	73	101
	B	100	..	73	107	80	86	107	45	85·3
	C	121	..	117	101	111	118	113	106	112·4
	D	113	..	103	118	117	86	125	118	112·9

* Surface irregularities interfered with results.

YIELD.

—		Pounds per Row.								
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	—
Unit at Bailey's, Atherton	A	53	50	40	46	43	40	46	34	†44
	B	66	54	48	60	53	45	50	35	51·4
	C	59	60	65	38	58	54	33	60	53·4
	D	61	65	49	45	54	42	50	62	52·2

† Comparing the yields of pairs of A and B by the Student method gives a probability of 700 to 1 that B outyields A.

The following conclusions are considered warranted:—

The infected seed was poor in germination in comparison with that from selected cobs. Careful selection of cobs on their appearance gave seed of good viability and no further advantage was gained in subjecting the cobs to the individual cob germination test for the presence of mould organisms. The treatment of infected seed with Tillantin R. did not significantly increase its germination but did increase the yield. This conclusion is based on the only unit which gave sufficiently good yields to justify a consideration of the figures. Each of the eight treated rows outyielded its untreated neighbour. This result is not considered conclusive owing to the small size of the plots, but is sufficiently suggestive to warrant particular attention to this point in the coming season. No reason for the increase can be advanced at this stage.

Careful note was taken of barren stalks and presence of cob rots in each row, but the figures show no consistent differences between the various treatments.

THE BANANA WEEVIL BORER.

BRIEF NOTES ON *Plaesius javanus* Er., THE HISTERID PREDATOR.

By J. A. WEDDELL, Entomological Branch.

AS has already been recorded, Mr. J. L. Froggatt[1] visited Java during 1928 for the purpose of making a collection of living insects predatory on the banana weevil borer, *Cosmopolites sordida* Chev.—an experiment in the biological control of that notorious pest. In December, 1928, a total of 3,066 beetles of *Plæsius javanus* Er. (Plate 4) was liberated in a banana plantation in the Cooran district of the near North Coast which was suitably infested with the banana weevil borer, a supply of food for the predators being thus ensured. A colony of the Leptid fly, *Chrysopila ferruginosa* Wied. (Plate 4), was also introduced and liberated, but no further trace of this insect has been found. These notes deal solely with the beetle predator.

Prior to the liberation it had been necessary for quarantine reasons to retain the insects in captivity, and both during this period and afterwards by occasional visits to the area of liberation, the writer was able to make a few life history notes on the insect which partly corroborate and partly supplement those previously on record.[2]

Egg-laying in Captivity.

The beetles were stored in Brisbane in flat tins 9 x 5½ x 2 inches, about thirty beetles being placed in each tin together with about 1 inch of fine soil. The soil was sifted occasionally at first and later every day. Altogether ten eggs were found loose in the soil by this means, but it was more than probable that many eggs were found and devoured by the carnivorous beetles between observations.

Egg-laying in the Plantation.

Eggs have been found from time to time out in the open plantation, and the fact that this has been possible indicates that a considerable amount of breeding has taken place, for while the egg is relatively large, being nearly 5 millimetres long, the quantity of rubbish and trash about a banana plantation makes the task of searching apparently hopeless. All of the eggs that have been found were lying in the half-rotting pseudostem material of old plants from which the bunch had been cut. They were always well into the interior and they lay in the intercellular spaces as shown in Plate 5. The eggs are generally found singly, except in the one instance when three eggs were found very close together as shown.

Development of the Larva.

Larvæ from various sources were kept under observation from time to time, but the number was necessarily small as every insect was needed so as to give the field colony the best possible chance of survival. However, two larvæ were sent from Java, a small number were hatched from the egg, and one was collected from Cooran and brought to Brisbane. In no case, however, was it possible to carry an individual completely through the larval stage under observation.

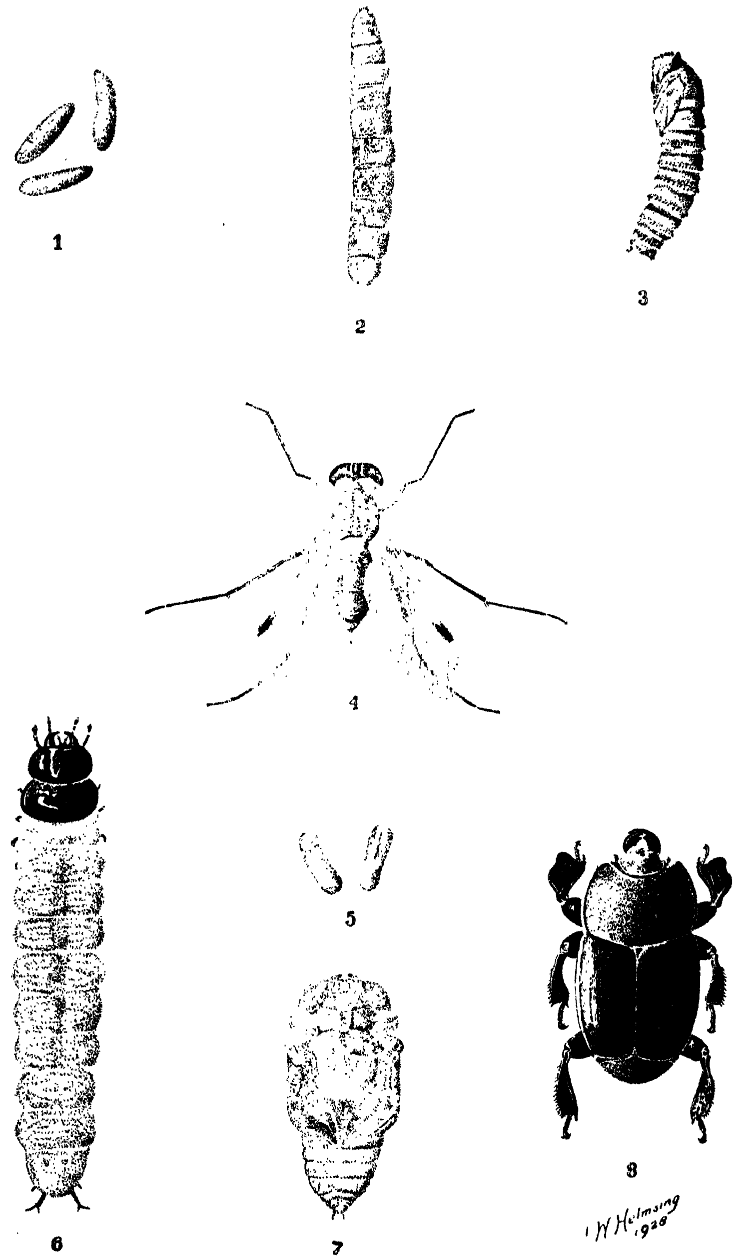


PLATE 4.

Figs. 1-4. Eggs, larva, pupa, and adult of *Chrysopila ferruginosa* Wied.

Figs. 5-8. Eggs, larva, pupa, and adult of *Plœsius javanus* Er.

Pupal Development.

The pupa that was under observation was pale cream in colour, but gradually the appendages darkened until they were distinctly brown. At the end of 48 days the adult beetle broke through the very delicate pupal investing membrane. The beetle was creamy with brown appendages on its emergence. It remained inactive in the pupal chamber for 15 days, during which the colour deepened to black.

It is rather interesting to note that this insect, reared in Queensland partly in the field and partly under artificial conditions, compared more than favourably in size with the native Javanese insects. Jepson records 11 to 13 millimetres as the length, while insects selected from those brought by Froggatt ranged from 10·8 to 17·1 mm. The insect reared here measured 17·5 mm.

Life Cycle Period in Queensland.

It is not possible even yet to give a reasonably exact figure for the life cycle period, but an approximation may be obtained. The egg stage lasted 8 to 9 days. Larvæ lived from 158 to 190 days without pupating. On the other hand, the large specimen mentioned above came from an egg that was laid in the plantation after the liberation on 11th December, 1928. As the larva entered the prepupal stage on 12th May, 1929, allowing for the egg period, the active larval stage in that case could not have exceeded 143 days. As previously mentioned, the insect was in the prepupal stage 33 days and the pupal period was 48 days. The temperature records made in the laboratory during the prepupal and pupal stages may be summarised as follows:

Minimum daily temperatures varied from 58 to 67 deg. Fahr.

Maximum daily temperatures varied from 62 to 72 deg. Fahr.

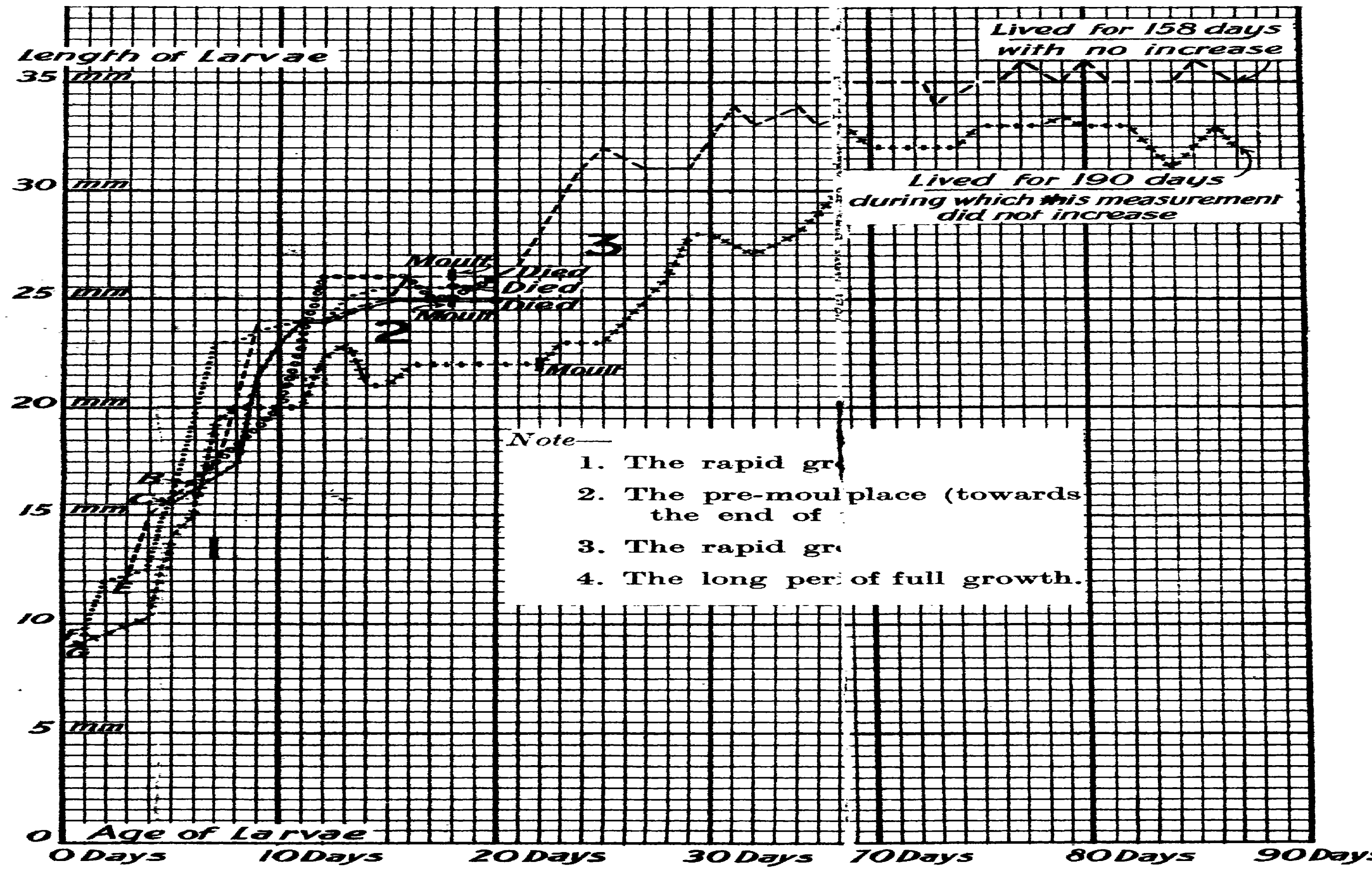
The total life cycle from oviposition to emergence of the adult in this case cannot have exceeded 8 plus 143 plus 33 plus 48, equalling 232 days. At the same time, it is obvious that the life cycle could not have occupied much less than this period. As the life cycle is so long and each individual insect thus must always experience a wide range of climatic conditions, it is unlikely that the time of year in which oviposition occurs will have very much effect on the total length of the life cycle.

Longevity of Adults.

Three beetles that were part of the consignment from Java were retained in Brisbane, and these remained alive 13 to 14 months after their collection as adults in Java.

Habits of the Insect.

Both the adult and the larva have been found in the banana plantation, frequenting the half-rotting pseudostem tissue and the tunnelled and decaying corms. Both stages are admirably adapted for moving about among this material, and it is here that they can do good work in controlling the borer. Banana weevil borer larvæ are frequently found in the pseudostem, while the adults make use of the half-rotted material as a shelter. Broken and apparently chewed portions of adult borers have been found in fairly close association with the Plæsius beetles.



Graph showing the daily records of length of the larvae of *Pla*ct that the larvae were fairly active.)

It is interesting to note that the predatory beetles are capable of strong flight and that they will readily take wing in the bright sunlight. This fact is of importance when natural spread of the insect is being considered. Unfortunately this ability of the insect to move readily makes it impossible in any way to gauge the population of the colony, and chance will be the only method of proving spread until such time as the colony is strongly entrenched. It may be noted that there are numbers of contiguous banana plantations in the area without boundaries or barriers of any kind, so that the insect is quite able to move away from the original area.

Since the original liberation occasional visits have been made to the locality. The insect has not been found in sufficient numbers to indicate any immediate possibility of its collection and distribution to other centres. There are two possibilities regarding it—one that the climatic or other conditions in Southern Queensland do not permit of the insect developing a large population, or, two, that a gradual increase is actually taking place coincident with a spread of the insect as yet unrecorded.

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RAT CONTROL.

Mr. John L. Anderson, of Barline, near Baddow, via Maryborough, writes:—I noticed in the "Queensland Agricultural Journal," last issue, "Rat Control in Sugar-cane Fields," by Dr. H. W. Kerr. Here is one method that I contend is better than any I have seen published. I have tried this out with good results, as it does not injure bird life and is one of the best in fowl-houses infested with rats. Curlews, magpies, peewits, wild turkeys, and butcher-birds are all good grub and other insect killers, and they will all eat the baits that are published. To destroy these birds means an increase in grub and other insects. The one I have tried is harmless to all bird life, but death to all animals. Here it is; and I hope that you will give it your consideration:—

Rat Poison for Fowl-Houses and Cane Fields.

To make biscuits, ingredients are the same as in barium biscuits. You add glass finely ground in place of barium carbonate, strychnine, or arsenic. It is also mixed in equal parts of pollard and flour and ground glass, slightly damp and made into pills about the size of a marble. It also can be given in dry form of pollard and glass. I would say that the pills are the best.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

SQUIRTER IN BANANAS.

CAUSES INVESTIGATED.

By NORMAN J. KING, Agricultural Chemical Laboratory.

THE physiological condition known as "squirter" in bananas has manifested itself since the earliest years of commercial banana production in the immediate North Coast. As far back as 1920 growers in the Cooroy district were troubled with this so-called disease, and in later years growers in all parts of the commercial areas from Gympie to Nerang who case fruit for the Southern market have had reported to them the development of this condition in their bananas during transport and ripening. Such areas as Dayboro, Samford, and Redland Bay, which supply all their fruit in the bunch form to the Brisbane market, have never been affected by this trouble; nor likewise have the Currumbin growers been apprised of such condition in their fruit, the bunches in this latter case being shipped direct from Murwillumbah to Sydney.

Early investigators discussed the possibility of the disease being due to a pathological organism. Professor Goddard, in a memorandum dated December, 1925, stated as follows:—

"With respect to the actual causal agent being a pathological organism, the work which has been done so far does not support this; it may be stated that this idea has not received support from the work of Mr. MacKinnon and Professor Goddard. It was the opinion of the latter at a very early stage that possibly a species of *Glœosporium* was responsible. This opinion, however, was of a purely preliminary nature, and was based on the action of species of Glœosporium in respect of ripening fruits, and further, the common occurrence of Glœosporium on ripening bananas. The general evidence, however, soon invalidated this opinion. It may be stated that although certain of these fungi are commonly found associated with the disease, not one of them is constant. The same statement would apply to bacterial forms."

The major difficulty encountered therefore in squirter control is the lack of knowledge as to the primary cause of the disease. If squirter were known to be the direct result of fungoid or bacterial infection, or that it were caused by the depredations of insects, suitable measures could be adopted for its control. As mentioned above, no positive results have so far been obtained from pathological investigations, and the condition developing in the fruit is assumed to be a physiological breakdown depending directly on factors obtaining on the plantation or during transport or ripening.

The bananas when packed in cases on the plantation for transport to Southern markets are separated from the hands and packed as "singles." Although by this method every banana is handled separately, the grower has no means of segregating unhealthy fruit, as they exhibit no indication of their potentiality for squirter development. If broken across in the green state, the cross section of the banana shows no abnormality whatever, the fruit in this green stage having all the characteristics of a perfectly healthy specimen. Certain growers, particularly in the Cooran-Cooroy section, maintain that they are able to detect squirter in the green fruit by its angular, unfilled appearance,

and the lack of development in the flower end of the fruit. When broken across these bananas show a red or reddish-brown discolouration about a quarter of an inch in diameter around the core of the fruit, which is usually of a rather gummy consistency. This condition is not squirter, but is gumming disease of bananas—a totally different type of disease.

The first indication the producer receives is a notification from the market agents that a certain percentage of his consignment was received in the condition described as squirter. This change takes place during transport to Southern States and the ripening processes applied there. These bananas reported as being affected by squirter are found to have developed a prematurely soft condition in the middle of the fruit; this portion of the banana turns to a soft watery mass, which squirts out of the end of the fruit when pressed. In more advanced stages the softening extends right out towards the skin, the latter exhibiting black blotches as in the case of very over-ripe fruit.

Investigations prior to this date have concentrated on studying conditions obtaining during transport and ripening processes, the theory most favoured being that this physiological breakdown developed during the transport by rail through the highlands of New South Wales in trucks wherein adequate protection from sudden changes in temperature was not assured. Considerable work was carried out investigating this phase of the problem, but in respect of this work it may be stated here that, although consignments of South Queensland bananas developed squirter on this route, it was never reported that North Queensland fruit had done so. Special consignments of North Queensland bananas, packed similarly to the Southern ones, were railed in the same trucks and under the same conditions to the same market, and yet failed to contract any symptoms of the trouble. In recent years control precautions have been taken in respect to covering of the truck consignments with tarpaulins, and it was reported that the percentage of squirter was not so high as before. It appears therefore that although the temperature conditions during transport may be, and probably are, a contributory factor in the chemical and physical changes which obviously occur, yet the cause of the breakdown is more fundamental and belongs to an earlier stage in the development of the fruit.

If the cause lay entirely in (*a*) temperature conditions during transport, (*b*) packing methods, or (*c*) ripening control, then no logical reason is possible to explain why the North Queensland fruit was not similarly affected. The only apparent difference in the life of these bananas is that the Northern fruit were grown under more equable climatic conditions. It would have been expected that if the origin of the trouble were closely related to transport, these latter fruit would be more susceptible, having been transported 1,000 miles further than the South Queensland fruit.

These facts, combined with previous field observations on the part of Departmental officers, fostered the theory that the primary cause was related to climatic or other conditions on the plantation. In April, 1926, the Secretary of the Institute for Science and Industry, commenting on the proposed plan of work for squirter investigation in Queensland, wrote as follows:—

"Under possible physiological causes, soil factors are omitted. Excess or deficiency of certain elements or compounds or certain physical or chemical or biological factors might be operating in the production of

the squirter condition. A critical examination of affected plantations will very greatly help in drawing up a scheme of experiments."
This was the first suggestion that squirter may possibly be correlated with soil conditions.

It was not until this year, however, that Professor Bagster, of the Queensland University, who is engaged on squirter investigation work, suggested to this Department that the question of soil relationship was an avenue of investigation worthy of exploitation. As a result of this, the writer, accompanied by Mr. W. J. Ross, Chief Inspector of the Banana Board, carried out an exhaustive field examination of the plantations from which bananas had developed squirter during transport to the South.

The area traversed was from Gympie to Nerang, no squirter ever having been reported north of the Gympie district. Soil samples were taken from selected locations on the plantations and detailed observations made with regard to aspect, slope, drainage, origin of soil (geological formation), nature of original vegetation, condition of plantation and of stools and bunches; details were usually obtained from the occupier as to incidence of frosts, coldest portions of the plantations, period elapsing between cutting of bunches and packing, and other relative matters.

It became a matter of difficulty in some areas to locate a plantation on which squirter had not developed, so that check soil samples could be taken. Soil sampling was also complicated by the fact that where a plantation had been affected by squirter only a very small percentage of the fruit had been reported as so affected. The grower whose method of picking is to take the most mature bunches from all over his block for any given consignment is usually unable to state from which portion of the block the squirter bananas were picked. In a small number of cases, however, where the grower was able to locate accurately where a certain affected consignment had originated, the area was always a low-lying section of the plantation fringing a gully and either exposed to cold draughts or known to be a place where cold air settled. This evidence seemed to indicate with some degree of reliance that the squirter development was in some way related to these cold conditions on the plantation, and if the soil were at all a contributory factor in its development, then it was in those locations that sampling should be carried out. The practice adopted, therefore, was to sample from the lower portions of the hill slopes on which the major proportion of the plantations of South Queensland are located, particularly along the sides of any gullies which ran up the slopes. Accumulations of alluvial wash from the hills were avoided, as were also any other interfering factors such as residues of the burn-off which preceded planting, &c. The soil was sampled with a 4-inch post-hole digger to a depth of 12 inches. Altogether 104 soil samples were taken, of which number twenty-seven were check samples from plantations on which no squirter had ever been reported by the market agents.

Geological Notes.

As a means of determining soil origin, field notes were taken on each plantation regarding the geology of the area under examination. The rocks from which the soils originated, although of great variety in type, did not vary widely in geological age. In the Gympie area the

majority of the plantations were located on the Gympie schists of Permo-Carboniferous age. The soils of the Goomboorian section of this district were developed from phyllites; some of the Glastonbury soils had their origin in augite lamprophyres, while those on Wolvi Mountain were developed on plagioclase basalts.

The Cooran and Pomona districts were located on Gympie schists, while the Cooroy-Eumundi section was divided between Devonian schists and basic igneous rocks.

Nambour and Landsborough districts stretched in each case from the coastal Ipswich series across the basalts of the Blackall Range to the Devonian shales and schists of Conondale and the Obi Obi Valley.

The soils of the Woodford-Kilcoy section were developed principally on schists, phyllites, and conglomerates of Silurian-Devonian age, with the exception of two areas in Woodford, which were of basaltic origin.

The Beenleigh district soils were overlying schists and quartzites of the Silurian-Devonian (Brisbane) series, the soils of the Nerang-Callagrabah-Mudgeeraba section being of similar origin. Burleigh Heads soils were basaltic.

Some 75 per cent. of the plantations had originally supported what is locally known as scrub growth, but which is defined botanically as rain forest of the Papuan-Malayan type. The remainder of the area had been, in its virgin condition, either open or sclerophyllous forest.

Investigations into the chemical composition of the South Queensland banana soils, particularly with respect to available plant nutrients and acidity, resulted in the figures which are tabulated in Table I. in this report. Grouped broadly, the results of analysis of those soils on which bananas develop squirter compare well with the analysis of those from squirter-free areas; the latter are given in the second portion of the table.

As mentioned previously in this report, particular attention was directed in the field to noting plantation conditions, among which factors soil type received a great deal of attention. Although the district traversed represents a strip of country some 150 miles in length following the ranges in a direction more or less parallel to the coast, the soil type remains remarkably uniform. Reference to Table I. shows that the soil description varies between very narrow limits from loam to clay loam. Very few soils of texture sufficiently light to justify the classification of sandy loam were encountered. Colour variations were common, but these were nearly always intimately related to the geological origin of the soils.

Before discussing in detail the results of the analyses, it may be of interest for comparative purposes to mention the analytical methods adopted for soil work in this laboratory. Many different ways have been proposed for the determination of that portion of the soil's mineral plant food supply which, by natural agencies, will be made available during the growing season of a crop. Of these, however, none have withstood the years of criticism and repetition on different soil types with the success of the 1 per cent. citric acid method proposed in 1894 by Dyer. As with all similar empirical procedures, the minimum limits below which fertilization with either phosphoric acid or potash may be expected to give results will vary, depending upon soil formation and

soil type. Dyer's original minimum limits as given for English soils were 0·01 per cent. for either phosphoric acid or potash, but it may be possible that these figures need some slight variation when applied to soils of a sub-tropical country. It should be understood that any method for the determination of available plant food is of necessity empirical, and unless other data are at hand can never be expected to give more than an indication as to probable limiting factors.

The nitrates in the soils were determined by a modification of the phenoldisulphonic acid method, which was first suggested by Grandval and Lajoux.[3]

Chlorides and other interfering ions are eliminated in this method. The availability of soil nitrogen is measured by the rate at which a soil, by means of its own bacteria, can produce nitrates from its insoluble organic nitrogen.[2] The figures are given as parts per million of nitrate nitrogen in the soil to a depth of 12 inches. Experiments have shown that, due chiefly to lack of air, very little nitrification takes place below this depth.

Lime requirement figures were obtained by the methods of Jones and Hopkins where the qualitative Truog test gave a strong reaction. These methods also are empirical, one giving a measure of the amount of the acidity and the other of the intensity of acidity present. The value of the resulting lime requirement figures depends to a large extent on the texture of the soil under examination, and where the soil type varies only between narrow limits, as in these soils, the lime requirement figures have their maximum comparative value.

Hydrogen ion concentration measurements to determine the pH of the soils were carried out by whichever method was found applicable to the particular soil. Where possible the quinhydrone electrode was utilised both in aqueous and normal potassium chloride suspensions. The large proportion of manganiferous soils, however, necessitated the use of the antimony electrode in aqueous and the hydrogen electrode in potassium chloride suspensions respectively.

The determination of chloride was carried out electrolytically by the silver chloride electrode.

Discussion of Analytical Results.

In discussing these tables, the soils of each district will be briefly reviewed and then the squirter-affected areas will be compared critically with the areas free from this disease.

The Gympie district, which is the largest banana-producing area affected by squirter, is, as mentioned previously, located on soils of varying geological origin. In some cases this origin is reflected in the plant food content of the overlying soils. As can be seen by referring to Table I. the soils of the Gympie district vary from section to section, soils in contiguous farms showing fair correlation, but wider variations exhibiting themselves when sections are compared. The Eel Creek and Scrubby Creek districts are universally low in available phosphoric acid and nitrates, potash is from fair to low, while lime is in most cases fair to good. The pH in water suspension varies from 5·38 to 7·84, the average figure being well above 6·0 pH. Hopkins lime requirement is high only in one case, and this soil has a very low lime content. A check

sample from Scrubby Creek has fair potash and very low phosphoric acid. Available lime is good, but nitrification power only fair.

Goomboorian soils are below average in all plant foods both in squirter affected and free areas.

Widgee and Wolvi Mountain soils are high in available potash, and the Widgee soils are also well supplied with lime. One of the Wolvi soils has very good phosphoric acid, but it is so far above the other soils of the same district that fertilization is suspected.

The Glastonbury soils have poor phosphoric acid, good lime, and fair potash content, but in no way vary significantly from a non-squirter sample in the same district except in potash content. The high potash of the check, however, is a result of the soil being developed from an augite lamprophyre of high potash content, and as the occurrence of this rock is very local, the freedom of contiguous plantations from squirter cannot be due to potash nutrition.

In the Cooran-Cooroy district phosphoric acid was very low both in affected and non-affected plantations; lime was also below average, and potash was from very low to very fair in each case. Three soils from Kin Kin are among the non-affected samples, but as these were all possibly fertilized their rather higher potash figures cannot be compared with others of the same district.

Soils from the Landsborough division are on the whole higher in phosphoric acid than the average soils, and this refers both to squirter and to check samples. The potash varies from poor to good in the squirter samples, but is low in the checks. Lime is fair to good.

The Woodford-Kilcoy line soils are all low in available nutrients. The soils of this district are nearly all poor. The vegetation is mainly open forest, and the entire region is too far inland to secure the incidence of rainfall which ensures banana production on the coastal belt. Seven samples from squirter-affected plantations and seven check samples do not show any significant variation to justify the application of a soil deficiency theory to squirter occurrence.

In the Beenleigh district the squirter-affected soils have, on the average, appreciably higher potash and slightly higher phosphoric acid than the check samples. Lime in each case is about the same, whereas in the soils of the Nerang division the phosphoric acid is slightly higher in the squirter samples and the potash appreciably higher in the non-affected areas.

This short discussion of the available plant foods, though unsatisfactory in many ways, shows clearly enough that nutritional deficiencies are not among the factors to be considered when inquiring into the causes of squirter development in bananas. Nor do physical properties of the soils in the field throw any more light on the matter.

The total nitrogen content of the soil, though no criterion of the availability, remains a fairly constant factor when considering such a large number of soils. The figures range usually from 0·2 to 0·3 per cent., and the average figures in squirter and check soils are 0·274 and 0·280 per cent. respectively.

Nitrates.

Examination of the figures indicating the nitrate content of the soils shows what is apparently a very wide variation both in initial nitrate and in the amount developed after an incubation period of four weeks. In the initial determinations the soils from squirter-affected areas exhibit a nitrate content varying between 1·3 and 61·3 parts per million, while the check samples range from 1·9 to 20·9 p.p.m. These minimum and maximum figures, however, are naturally extreme cases, and the average figures for the affected and the non-affected soils agree very closely. Deviations from the mean become considerable in a few cases, one abnormal soil developing on incubation 278 p.p.m. of nitrates. There appears to be no significant difference between the soils when considered from this point of view. The average initial figure for the squirter soils was 8·3 p.p.m. as against 7·3 for the check samples, while the final figures after incubation were 29·5 and 29·3 p.p.m. respectively.

The nitrogen compounds of the soil are mainly organic, and in such form are unavailable to higher plants. The action of micro-organisms results in the transformation of this organic nitrogen to an inorganic and available form. This microbiological activity also results in the changing of a non-soluble form of nitrogen into a highly soluble one (nitrate nitrogen) which, being only weakly absorbed by the soil colloid, is rapidly leached from the soil. As the activities of the organisms responsible for nitrite and nitrate production from soil organic matter are closely interrelated with soil acidity[2], an effort was made to correlate nitrates with the soil reaction.

Accordingly a dot diagram was constructed in which parts per million of NO_3 were plotted against hydrogen ion concentration. A rough correlation is exhibited, the lowest figure being in an acid soil of pH 4·3, and the highest figures occurring in alkaline soils of pH 7·5 to 8·7. On the whole there is a general tendency for the more alkaline soils to develop a higher content of nitrates, but as calcium carbonite is present usually in the most acid soils the failure to obtain a more exact correlation is explained.

The geographical and topographical location and climatic conditions of the banana-growing areas are not conducive to nitrate retention. Steep slopes, well-drained soils, and high rainfall all contribute towards loss of nitrates by leaching from the soil. The incubation test, however, shows the presence of the necessary bacteria in the soils, the existence of a favourable carbon-nitrogen ratio for nitrate formation, and gives some measure of the rate of availability of the total nitrogen in the soil under the conditions then pertaining.

Lime requirement figures for Hopkins' acidity reached high figures only in isolated cases. These very acid soils were usually associated with steep slopes where severe washing had exposed a more acid subsoil. Observations on the plantations, however, failed to note any retarding effect on plant growth due to acid conditions. No mention can be found in literature regarding limiting figures of acidity for banana growth, but from consideration of its tropical natural habitat it is to be expected that it would be fairly acid-tolerant. Acidity figures in terms of pH appear to vary between fairly wide limits, but the soils above pH 8·0 and those under pH 5·5 are exceptions. The average figures are from pH 6·0 to pH 7·5.

The figures for chlorine are very low, rarely being in excess of 0·02 per cent. These determinations were carried out as a matter of interest, it being a generally accepted fact that bananas favour an appreciable salt content of the soil. It has been shown[1], however, as early as 1913 in Queensland, that our coastal soils contain sufficient salt for the needs of the plant, and that no improved crops were received after application of larger amounts.

Considered collectively, the analytical results of the seventy-seven soils from squirter-affected plantations and the twenty-seven samples from non-affected areas compare exceedingly well in most respects. Whatever differences make themselves manifest in the average figures are in favour of the squirter areas, and although individual analyses, when compared, show sometimes slight differences in a particular district, these variations disappear when the figures are averaged. The only conclusion to be drawn, therefore, from these figures is that the development of squirter is not closely related to soil conditions or nutrient deficiency. The one factor which tends to qualify this statement is the one discussed early in this report. If it were possible to locate accurately on the plantation the stools which bore squirter bananas it might be possible then to detect significant differences between the soil in those spots and the soils of non-affected areas. But without this very precise information, it does not seem practical to carry out an investigation from the soil aspect upon the results of which more reliance can be placed. If squirter developed during transport in Queensland, it would also be possible, and perhaps confirmatory, to carry out detailed analyses of the fruit and leaves of affected stools for comparison with similar analyses on non-affected plants. It is an accepted theory with some plants at least that the percentage of plant foods present in the plant itself is an index of the availability of those plant foods in the soil in which the plant is growing. Since, however, squirter does not develop freely in Queensland, it was not possible for such investigations to be carried out. This aspect of the nutritional requirements of the plant is one which may yield results in any further investigation, and an exhaustive analysis of the mineral constituents of the fruit may throw light on the subject. It is a logical possibility that any physiological breakdown of a biochemical nature in the fruit of the banana plant could be intimately bound up with the mineral constituents of the fruit. Potassium is presumably an integral constituent of protoplasm. It is possible that it may also be intimately connected with the formation of the starches and sugars of the plant. Phosphorus is in all cases essential to plant development, for it forms a constituent of many proteids. Phosphates are usually present in the living cell in a dissolved form. Nitrates and compounds of magnesium are also essential factors in plant growth, a deficiency of either causing cessation of normal development, or deficiency diseases of the plant. Although this investigation into soil nutrients has given only negative results, the above points are stressed to show the primary importance of available plant foods to the growth and development of plants.

Aspect and Drainage.

Soil texture and topographical location reduce to a minimum any possibility of bad drainage in the plantations affected by squirter, nor does geographical aspect seem to bear a relation to its occurrence. The advent of cold winds at a critical period in the development of the fruit

suggested itself as a possible cause. The discovery of squirter, however, from plantations well sheltered from westerly winds entirely disposed of this possibility, contiguous areas with similar aspect, slope, and shelter often producing fruit which on one farm was healthy and on the other affected by squirter.

Nature of Vegetation.

As a general rule scrub lands have been selected for banana-growing, but, as previously mentioned, forest areas have also been extensively exploited. Virgin country is usually selected, and the burn-off naturally supplies an abundance of mineral plant foods, particularly potash, for the needs of the plant during the early stages of its growth. This applies in a much greater degree to the scrub lands where the stand of timber is so much heavier than in the forest country. The benefit accruing from this extra available plant food is only a transitory one. The high rainfall of these areas, combined with the steep slopes, militates against the conservation of soluble material, and the plant ash constituents are rapidly leached out. It is therefore not surprising that the analyses of scrub and forest soils do not show significant differences, the reason for the difference in virgin timber being one of climatic conditions only and not of soil variability.

Conclusions from Field Observations.

The analytical data show definitely that squirter occurs on all types of soil from the poorest forest soil, which has grown bananas for twelve years without fertilization, to rich new scrub land in its first year of bunching. But one factor remains constant on all plantations—where a gully or hollow encroaches sufficiently far up the slope of the hill as to reach into the banana area, squirter is found to occur on that plantation. It would therefore appear that squirter is caused by the following conditions:—

(*a*) The fruit is primarily subjected to a cold spell on the plantation during the maturing period of the bunch, bringing about a cessation of certain physiological processes in the ripening of the fruit and rendering it subject to complete physiological breakdown in the event of further conditions such as obtain during transport.

(*b*) It is possible that further development of the breakdown process in the fruit tissues is then brought about by sudden and considerable variations in temperature which are apt to occur during transit to Southern markets at certain times of the year, or to contamination at this stage by an organism. The writer has been informed by Mr. Hack, a growers' representative on the Banana Board, that temperature variations of as much as 23 deg. were recorded in the trucks over a period of two hours.

(*c*) The ripening methods used in the Southern capitals may also contribute towards the ultimate condition of the fruit, but this is unlikely. The changes taking place in the fruit as a result of subjection to low temperature conditions may be concerned possibly with enzyme activity in the ripening and maturing of the banana, and would be principally biochemical in nature. The ripening methods may then tend towards the

accentuation of a condition brought about by cessation of enzyme activity, finally resulting in the soft, watery internal structure so characteristic of squirter.

In support of the writer's contention that the primary cause is on the plantation, the following extract is quoted from a letter signed by Mr. Ranger, Manager of the Committee of Direction of Fruit Marketing, in 1925:—

> "For example, in the latter portion of last July we had very severe frosts in Queensland. Fruit that was being railed and in transit at that time arrived in good condition, and there were no complaints of squirter. Fruit railed the following week suffered very severely from this disease. . . ."

It is also significant that the reports of squirter in bananas have increased considerably in recent years. This fact can very easily be correlated with plantation conditions. In the early days of the industry on the immediate North Coast, scrub was felled in isolated areas for commercial banana production. The cleared blocks, afterwards producing fruit, were well sheltered by the surrounding scrub from the advent of cold winds or frosts. In later years, when banana prices were at their peak, most of the available land was cleared and planted. This resulted in opening up the hillsides and the surrounding country, clearing it of all standing timber, which had previously acted as a natural protection to a tropical fruit grown out of a latitude to which it was indigenous, and generally exposing the plantation to climatic conditions which were totally unfit for their crops. The result was increasing reports of squirter, due to the altered temperatures obtaining on the plantation.

Control.

In most investigations into diseases, control measures constitute an important part of the work. But assuming that the conditions enumerated above are contributory factors in the development of the disease, it becomes clear that preventive measures of the usual type cannot be used. If squirter develops in the low-lying sections of a plantation and is caused by frosts and the settling of cold air in those places, the only control measure is the elimination of those portions of the plantation. Where destruction of natural shelter has opened the way for the ingress of cold draughts, the grower has no alternative but to seek more sheltered land. The only control which could exercise a preventive influence would be a mild winter, and the proof of this theory is exemplified in the very mild winter experienced in south-eastern Queensland in 1931, when squirter reports were less frequent than they had been for many years.

Acknowledgment.

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Table 1a.—SOILS ON WHICH BANANAS DEVELOP "SQUIRTER."

Laboratory No.	Soil No.	Locality.	Description of Soils.	Moisture (air dried sample).	Calculated on Soil dried at 100° C.: Loss on Ignition.	Chlorine.	Nitrogen: Total.	Nitrogen: As Nitrate: Initial.	As Nitrate: Incubation Period: 14 days.	As Nitrate: Incubation Period: 28 days.	Soluble in 1 per cent. Citric Acid: Phosphoric Acid.	Soluble in 1 per cent. Citric Acid: Lime.	Soluble in 1 per cent. Citric Acid: Potash.	Lime Requirement per acre foot: Jones.	Lime Requirement per acre foot: Hopkins.	Acidity: Truog Test.	Acidity: pH: Water Suspension 1:2	Acidity: pH: N/KCl Suspension 1:2
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
3330	1	Gympie Eel Creek	Br. L.	7·7	10·4	·007	·249	5·9	27·8	19·6	·0033	·3488	trace	..	..	v. sl.	6·80	5·69
3331	2	Do. do.	Br. L.	8·4	11·5	·009	·208	2·7	20·3	10·6	·0013	·0484	Nil	99·6	19·2	med.	6·46	4·66
3332	3	Do. do.	R. Cl. L.	10·3	9·1	·011	·212	3·5	13·7	12·2	·0036	·1870	trace	..	..	v. sl.	6·88	4·90†
3333	4	Do. do.	R. Br. Cl. L.	8·0	10·1	·010	·183	3·2	16·7	16·7	·0026	·0237	trace	199·6	110·0	str.	5·38*	4·23
3334	5	Do. do.	R. Br. Cl. L.	7·1	9·9	·006	·253	5·7	27·3	14·4	·0061	·1375	·0022	97·5	2·4	sl.	6·12*	4·38†
3335	6	Do. Scrubby Creek	R. L.	7·5	9·7	·011	·206	24·9	30·6	21·3	·0003	·0660	·0105	112·4	8·7	sl.	5·70*	4·30†
3336	7	Do. do.	G.B.L.	11·1	13·2	·010	·296	7·0	28·1	29·5	·0012	·2120	·0039	..	..	v. sl.	7·53	5·09†
3337	8	Do. do.	R. L.	7·0	9·3	·005	·264	5·5	28·1	24·6	·0024	·1181	·0108	74·2	1·2	sl.	6·95	4·84†
3338	9	Do. do.	Choc. L.	8·1	10·6	·014	·238	4·7	20·6	21·6	·0012	·3200	·0027	..	..	v. sl.	7·16*	5·97†
3339	10	Do. do.	Choc. L.	9·9	13·7	·018	·423	11·8	20·0	28·4	·0027	·4300	·0079	..	..	nil	7·84	6·70
3340	11	Do. do.	Br. L.	6·8	9·2	·005	·300	11·0	32·0	17·4	·0021	·0725	·0043	114·5	39·3	med.	5·66*	4·75
3342	13	Do. Goomboorian	G. B. L.	6·6	13·0	·005	·330	6·0	23·6	19·7	·0095	·1748	·0145	74·2	2·8	sl.	6·84*	5·45
3344	15	Do. do.	Br. Cl. L.	8·6	11·0	·006	·276	6·7	16·2	25·0	·0025	·3360	·0075	..	..	nil	7·64	7·09
3345	16	Do. do.	G. Br. L.	7·0	11·8	·002	·211	1·7	14·4	6·9	·0103	·0512	·0088	146·3	16·9	str.	5·43	4·39
3346	17	Do. do.	Br. S. L.	7·1	14·7	·003	·288	3·4	21·7	11·0	·0047	·0355	·0073	144·2	9·4	str.	5·76	4·49
3347	18	Do. do.	Lt. Br. Cl. L.	6·1	11·8	·004	·334	13·6	34·6	14·7	·0167	2730	·0057	..	..	sl.	7·08*	5·55†
3349	19	Do. Widgee	R. Br. L.	5·9	12·5	·002	·351	7·0	31·0	29·3	·0015	·3811	·0310	..	..	nil	8·25	6·18†
3350	20	Do. do.	R. Br. L.	4·0	7·1	·006	·235	3·5	22·0	33·5	·0011	·3338	·0227	..	..	nil	8·51	6·22†
3351	21	Do. Wolvi Mt.	R. Br. L.	12·8	17·8	·005	·365	7·3	43·5	50·3	·0026	·2136	·0413	42·0	1·2	sl.	7·02	6·27
3352	22	Do. do.	R. Br. L.	14·0	18·0	·001	·344	4·0	23·5	28·3	·0034	·1765	·0088	87·0	1·2	sl.	6·46	5·55
3354	24	Do. do.	Y. Br. L.	7·6	3·8	·018	·109	3·0	4·0	7·0	·0375	·0454	·0280	57·0	29·0	med.	5·07	4·37
3355	25	Do. Mooloo	R. Br. L.	9·2	14·7	·020	·447	11·2	55·9	56·5	·0017	·4570	·0157	..	..	nil	7·74	6·53†
3356	26	Do. do.	Choc. L.	7·5	14·9	·042	·570	49·5	216·2	278·0	·0012	·1890	·0130	..	..	nil	7·96*	7·18†
3357	27	Do. do.	Choc. L.	7·6	12·1	·003	·369	15·4	36·9	54·6	·0084	·4003	·0121	..	..	nil	8·42	6·65†
3359	29	Do. Lagoon Pocket	R. Br. L.	12·8	18·7	·005	·691	20·0	47·3	52·6	·0980	·4951	·0038	..	..	nil	7·98*	7·12†
3361	31	Do. Brooloo	R. Br. L.	6·0	5·8	·004	·213	25·0	70·6	52·3	·0046	·1360	·0577	..	..	v. sl.	8·11	7·84
3362	32	Do. Blunder Road	R. Br. L.	9·6	11·1	·002	·260	6·4	26·3	28·0	·0013	·2621	·0225	..	..	v. sl.	7·33	6·13
3363	33	Do. do.	R. Br. L.	5·6	8·8	·003	·215	10·5	15·7	16·3	·0025	·1536	·0350	..	..	v. sl.	6·95*	5·27†
3364	34	Do. Glastonbury	Br. Cl.	7·4	11·6	·006	·357	6·5	34·6	39·3	·0040	·3270	·0093	..	..	v. sl.	7·99	5·82†
3365	35	Do. do.	R. Br. Cl.	9·0	13·9	·004	·413	22·4	42·8	49·3	·0003	·5720	·0083	..	..	v. sl.	8·73	7·50†
3371	37	Cooran	Y. L.	4·5	11·4	·003	·303	8·0	61·1	25·0	·0010	·1261	0059	30·0	..	sl.	6·37	5·70
3373	39	Do.	G. Br. L.	6·7	10·4	·009	·300	5·4	28·4	23·5	·0029	·1151	·0032	45·0	..	sl.	6·54*	4·94†
3374	40	Do.	Lt. Br. Cl. L.	9·0	11·9	·009	·300	6·0	10·1	16·8	·0025	·0140	·0044	151·0	82·4	str.	4·70	4·11
3375	41	Do.	Y. Br. L.	4·2	14·9	·004	·258	3·9	13·6	29·1	·0035	·0314	·0046	197·0	142·5	str.	4·56	3·89
3376	42	Do.	Br. L.	4·0	4·9	·002	·246	5·7	trace	8·7	·0031	·0918	·0178	..	..	v. sl.	7·00	4·55†
3378	44 (a)	Do.	G. Br. L.	7·1	8·5	·007	·280	11·5	2·1	33·1	·0066	·1951	·0035	..	..	v. sl.	6·76	5·76
3379	45	Cooroy	Y. Br. L.	7·1	9·1	·005	·288	5·1	3·8	19·2	·0011	·0288	·0058	129·0	96·2	str.	4·66	4·05
3381	47	Do.	Br. L.	10·0	8·3	·017	·256	6·9	10·2	22·5	·0031	·0623	·0033	81·0	36·5	str.	4·76	4·15
3383	49	Do.	Lt. Br. L.	1·8	7·3	·020	·316	8·6	3·3	5·1	·0048	·0378	·0063	108·1	58·9	str.	4·56	4·00
3384	50	Eumundi	G. Br. L.	2·4	5·9	·028	·189	5·2	23·0	1·6	·0045	·0200	·0081	148·4	101·3	str.	4·27	4·00

(a) Contains 14 per cent. stones. * Antimony Electrode. † Hydrogen Electrode.

Table 1a.—SOILS ON WHICH BANANAS DEVELOP "SQUIRTER"—*continued.*

Laboratory No.	Soil No.	Locality.	Description of Soils.	Calculated on Soil dried at 100° C.										Lime Requirement per acre foot.		Acidity.		
							Nitrogen.				Soluble in 1 per cent. Citric Acid.						pH.	
								As Nitrate.										
									Incubation Period.									
				Moisture (air dried sample).	Loss on Ignition.	Chlorine.	Total.	Initial.	14 days.	28 days.	Phosphoric Acid.	Lime.	Potash.	Jones.	Hopkins.	Truog Test.	Water Suspension. 1 : 2	N/KCl Suspension. 1 : 2
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
3385	51	Eumundi ..	Bl. L.	6·4	11·1	·030	·185	12·5	11·5	27·5	·0108	·3310	·0064	..	..	v. sl.	7·28	5·46†
3386	52	Do. ..	G. L.	3·8	7·5	·019	·381	6·0	6·5	16·8	·0252	·0480	·0078	..	..	med.	5·19	4·51
3389	53	North Arm	G. Br. L.	3·8	6·1	·011	·268	19·1	81·7	46·3	·0022	·1163	·0046	..	..	v. sl.	5·60	4·90
3390	54	Nambour	G. B. S. L.	1·5	5·0	·014	·096	7·7	2·9	2·8	·0087	·0276	·0065	82·7	62·8	str.	4·64	4·15
3391	55	Woombye	G. S. L.	11·8	19·9	·026	·552	61·3	38·5	92·1	·0024	·3150	·0082	..	..	v. sl.	6·64	5·99
3393	56	Nambour	Choc. L.	2·1	14·1	·004	·469	10·9	17·2	35·8	·0176	·6350	·0079	..	..	nil	8·26*	6·95†
3392	57	Obi Obi ..	G. B. L.	3·0	10·3	·006	·231	15·4	35·4	63·1	·0158	·4566	·0125	..	..	nil	8·00	7·30†
3397	61	Mooloolah	B. S. L.	3·0	6·0	·009	·179	7·5	3·1	trace	·0157	·2375	·0097	119·2	58·1	str.	5·14	4·34
3398	62	Conondale	B.L.	4·0	7·9	·004	·284	3·3	11·7	17·6	·0120	·1718	·0093	..	..	v. sl.	7·50*	5·97†
3399	63	Landsborough	B.L.	7·1	11·5	·019	·181	2·7	3·8	12·2	·0545	·1661	·0231	123·0	28·3	med.	5·33	4·41
3400	64	Do. ..	Choc. L.	5·9	15·3	·008	·318	7·2	20·4	29·6	·0197	·2521	trace	..	..	v. sl.	6·30	5·26
3402	66	Do. ..	Choc. L.	6·8	10·8	·012	·350	3·7	11·4	15·5	·0027	·1362	·0014	89·0	19·6	med.	5·41	4·49
3403	67	Do. ..	Choc. L.	8·3	22·4	·022	·410	7·6	25·4	32·3	·0072	·3380	·0061	..	..	v. sl.	6·34	5·57
3404	69 (*b*)	Do. ..	Choc. L.	6·4	8·1	·009	·402	25·5	125·7	82·3	·0183	·1455	·0010	..	..	v. sl.	5·86	5·19
3406	70	Do. ..	Choc. L.	7·9	13·4	·002	·281	3·9	16·6	14·0	·0263	·1956	·0249	..	..	sl.	6·75	5·31
3413	71	Kilcoy ..	Br. L.	3·2	9·1	·004	·266	7·3	26·3	25·3	·0216	·2265	·0040	..	..	v. sl.	7·79	6·20†
3417	75 (*c*)	Do. Neurum ..	G. Br. L.	2·8	6·4	·003	·208	1·5	13·0	24·5	·0035	·1082	·0036	..	..	sl.	6·42	5·53
3419	77	Woodford..	Br. L.	2·8	7·8	·002	·224	2·9	22·6	20·4	·0079	·2560	·0008	63·6	2·4	sl.	5·87	5·27
3420	78 (*d*)	Wamuran..	G. Br. L.	2·1	8·5	·001	·172	9·1	5·1	4·7	·0035	·1065	·0037	59·4	1·2	sl.	6·01	5·03
3421	79	Do. ..	R. Br. L.	2·7	11·0	·001	·241	14·5	28·9	65·6	·0051	·0432	·0056	..	..	v. sl.	7·36*	5·68†
3423	81	Do. ..	Br. L.	2·4	5·5	·0005	·367	3·3	7·6	14·1	·0039	·2220	·0118	42·4	1·6	sl.	6·72*	4·76†
3424	82	Do. ..	Br. L.	8·9	9·1	·002	·367	4·0	25·6	28·5	·0014	·1431	·0054	..	..	v. sl.	7·74*	4·84†
3429	85	Oxenford ..	Br. L.	4·1	9·9	·003	·321	trace	5·5	13·6	·0087	·0328	·0200	248·0	164·9	str.	4·49	3·54
3430	86	Do. ..	Buff. L.	4·7	7·5	·002	·314	3·6	21·2	35·7	·0103	·0352	·0199	110·2	2·7	med.	5·38	4·39
3431	87	Do. ..	Br. L.	5·3	10·5	·002	·332	7·8	24·4	47·5	·0021	·1780	·0257	..	..	v. sl.	8·08	7·09†
3438	89	Pimpama	G. Br. L.	3·7	10·3	·002	·395	3·2	38·5	33·2	·0038	·6730	·0301	..	..	v. sl.	8·08	7·46†
3434	90	Do. ..	R. Br. L.	4·0	13·3	·004	·427	5·2	15·7	33·8	·0008	·1890	·0595	..	..	sl.	6·76*	5·01†
3438	92	Nerang ..	R. Br. L.	7·6	8·0	·011	·297	1·0	20·5	20·1	·0029	·2400	·0066	..	..	v. sl.	7·93	5·77†
3439	93	Do. ..	R. Br. L.	6·9	12·1	·003	·320	trace	11·5	11·8	·0215	·2404	·0063	..	..	sl.	6·65	5·82
3440	94	Do. ..	R. Br. L.	8·4	14·9	·003	·337	trace	10·7	11·0	·0031	·4171	·0007	..	..	nil	8·04*	6·93†
3441	95	Do. ..	R. Br. L.	4·8	6·1	·001	·471	trace	9·5	9·3	·0155	·6907	·0201	..	..	sl.	6·50*	4·68†
3442	96	Do. ..	R. Br. L.	6·0	10·0	·001	·269	1·8	21·2	24·3	·0013	·1130	·0041	..	..	sl.	6·54*	4·86†
3443	97	Do. ..	R. Br. L.	5·2	7·9	·001	·201	trace	9·4	16·7	·0155	·0103	·0053	..	..	sl.	6·76*	4·68†
3444	98	Callagrabah	Br. L.	6·3	9·9	·001	·258	trace	4·7	9·9	·0012	·1420	·0057	..	..	v. sl.	7·08*	5·06†
3445	99 (*e*)	Do. ..	Br. L.	7·4	10·5	·005	·352	2·7	13·1	33·4	·0022	·1090	·0044	..	..	v. sl.	7·86	5·06
3446	100	Do. ..	R. Br. L.	8·5	11·8	·014	·294	1·3	22·5	28·5	·0054	·0540	·0150	99·6	9·0	med.	5·27	4·64
3448	102	Mudgeeraba	Br. L.	4·0	6·8	·0005	·280	trace	18·7	22·0	·0059	·0390	·0009	86·3	15·7	str.	5·25	4·42
..	..	Average of 77 Soils ..	..	5·2	10·4	·008	·274	8·3	26·3	29·5	·0088	·1974	·0107	..	..	..	..	..

(*b*) Contains 51 per cent. stones. (*c*) Contains 33 per cent. stones. (*d*) Contains 35·1 per cent stones. (*e*) Contains 23·2 per cent. stones.
* Antimony Electrode. † Hydrogen Electrode.

Table 1b.—SOILS ON WHICH BANANAS DO NOT DEVELOP "SQUIRTER."

Laboratory No.	Soil No.	Locality.	Description of Soils.	Moisture (air dried sample)	Calculated on Soil dried at 100° C. Loss on Ignition.	Chlorine.	Nitrogen. Total.	Nitrogen. As Nitrate. Initial.	Nitrogen. As Nitrate. Incubation Period. 14 days.	Nitrogen. As Nitrate. Incubation Period. 28 days.	Soluble in 1 per cent. Citric Acid. Phosphoric Acid.	Soluble in 1 per cent. Citric Acid. Lime.	Soluble in 1 per cent. Citric Acid. Potash.	Lime Requirement per acre foot. Jones.	Lime Requirement per acre foot. Hopkins.	Acidity. Truog Test.	Acidity. pH. Water Suspension. 1 : 2	Acidity. pH. N/KCl Suspension. 1 : 2
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
341	12	Gympie Scrubby Creek ..	Choc. Light C. L.	12·4	14·3	·007	·320	8·0	26·2	24·5	·0014	·3640	·0069	..	..	v. sl.	7·36*	5·70†
3343	14	Do. Goomboorian ..	G. Br. L. ..	1·1	8·4	·005	·187	1·9	13·4	17·0	·0022	·1095	·0069	55·1	2·4	sl.	6·68*	5·29
3353	23	Do. Wolvi	G. Br. L. ..	8·8	12·6	·001	·403	9·3	21·9	21·2	·0136	·0857	·0079	153·0	35·3	med.	5·28	4·29
3358	28	Do. Lagoon Pocket ..	G. L. ..	8·5	16·4	·001	·515	9·4	40·0	40·5	·0091	·4060	·0035	..	..	nil	8·01	7·04†
3360	30	Do. Brooloo	Choc. L. ..	5·7	11·1	·003	·403	12·6	54·3	59·0	·0004	·3730	·0351	..	..	nil	8·58	8·35
3366	36	Do. Glastonbury ..	G. Br. L. ..	4·1	8·9	·002	·228	10·2	28·3	25·3	·0065	·2675	·0353	..	..	v. sl.	7·38	5·45†
3372	38	Cooran	Y. L. ..	6·7	10·9	·009	·300	4·6	19·7	47·0	·0015	·0135	·0049	108·0	52·2	str.	4·71	4·22
3377	43 (f)	Do.	Br. L. ..	3·1	7·6	·006	·281	20·9	13·2	60·0	·0066	·1072	·0105	..	..	sl.	6·20*	4·53†
3380	46	Cooroy	Y. Br. L. ..	10·4	9·3	·024	·281	4·4	7·4	13·6	·0016	·0232	·0040	159·0	162·9	str.	4·29	3·84
3382	48	Do.	Br. L. ..	6·4	8·6	·018	·253	10·3	4·5	18·2	·0028	·0867	·0020	..	..	med.	4·82	4·13
3394	58	Kin Kin	Br. L. ..	2·7	14·4	·014	·288	7·9	23·4	34·8	·0050	·0426	·0086	..	..	v. sl.	7·24	6·20†
3395	59	Do.	Lt. Br. C. L.	1·8	10·4	·002	·228	5·3	24·6	27·3	·0032	·0868	·0083	110·2	19·6	med.	5·29	4·34
3396	60	Do.	Heavy C. L.	1·3	8·9	·002	·225	5·8	22·7	31·6	·0030	·0490	·0109	..	..	v. sl.	6·58	5·76
3401	65	Landsborough	Choc. L. ..	7·3	14·2	·016	·176	9·3	14·2	24·8	·0176	·2650	trace	..	..	v. sl.	6·23	5·41
3405	68 (g)	Do.	Choc. Lt. C.	6·8	6·3	·003	·366	6·9	6·3	26·9	·0117	·1310	·0075	..	..	sl.	6·22*	5·24
3414	72	Kilcoy	Br. L. ..	5·5	9·6	·004	·296	7·1	25·4	24·9	·0097	·2480	·0057	..	..	v. sl.	7·78	5·97†
3415	73 (h)	Do.	Br. L. ..	4·7	13·8	·002	·225	3·9	8·9	15·8	·0026	·1760	·0020	..	..	v. sl.	7·34	5·68†
3416	74	Do. Neurum	Br. L. ..	5·8	12·3	·002	·363	4·7	26·2	36·1	·0032	·2761	·0017	..	..	v. sl.	7·28	6·03
3418	76	Woodford..	Br. L. ..	4·1	7·6	·001	·163	14·6	17·9	28·9	·0093	·1101	·0013	..	..	v. sl.	6·44	5·16
3422	80	Wamuran..	Br. L. ..	1·7	8·0	·0005	·182	2·6	14·4	20·9	·0056	·0306	·0043	214·1	259·0	v. str.	4·78	3·86
3425	83	Do.	Br. L. ..	4·5	7·9	·001	·218	2·7	3·1	4·2	·0048	·1189	·0035	..	..	sl.	6·64	5·70
3426	84	Caboolture	Br. L. ..	2·9	8·4	·001	·245	3·7	14·2	9·0	·0039	·2430	·0066	67·8	3·1	med.	5·62	4·51
3432	88	Oxenford	G. Br. L. ..	2·0	6·1	·001	·171	trace	10·9	19·3	·0050	·3660	·0065	148·4	57·7	str.	5·07	4·14
3435	91	Pimpama	G. Br. L. ..	2·2	5·7	·002	·247	12·4	43·2	60·0	·0048	·0950	·0336	..	..	sl.	6·49	5·44
3447	101	Callagrabah	R. Br. L. ..	6·1	12·6	·003	·304	2·4	31·1	30·8	·0109	·1118	·0099	..	..	sl.	6·36*	4·76†
3449	103	Burleigh Heads	Choc. Cl. L. ..	14·6	15·9	·004	·362	7·6	34·5	28·4	·0012	·1548	·0007	..	..	sl.	6·04	5·02
3450	104 (i)	Do.	Choc. Cl. L. ..	9·8	13·1	·003	·339	8·2	37·2	41·2	·0091	·1070	·0218	..	..	med.	5·87	5·05
		Average of 27 Soils ..	..	5·4	10·5	·005	·280	7·3	21·7	29·3	·0058	·1647	·0092	..	..	..	..	..

(f) Contains 20·1 per cent. stones. (g) Contains 51·5 per cent. stones. (h) Contains 42 per cent. stones. (i) Contains 31·5 per cent. stones.

* Antimony Electrode. † Hydrogen Electrode.

MARKETING PASSION FRUIT.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THERE are many growers at present growing passion fruit who do not think that it would pay them to grade and pack their fruit for market. These growers often wonder why they do not get the prices quoted in the market-reports, and blame everybody but themselves for this state of affairs. When one sees the many classes of passion fruit, such as first quality, small, crinkly, woody, dummy, and diseased fruit that are often all thrown together to make a case, it is easy to understand why there is a big difference in prices. Growers have often complained that they have not gained materially in enhanced prices after going to the trouble of packing, forgetting that it takes time to restore, by good grading and packing, the confidence that has been destroyed by slipshod methods. It is only by the regular and continued application of sound up-to-date methods that a brand becomes known and appreciated, with the consequent increase in demand and price. Good grading and packing, coupled with regular supplies to the same distributors irrespective of market vagaries, will always secure the best results for the season's marketing.

Harvesting.

To harvest passion fruit different methods are used, growers in some cases picking and in others allowing the fruit to fall. The best method is to pick; although in the colder parts of the State, situated near the markets, it does not affect the selling value on the local market to allow the fruit to fall. When sending any distance, the fruit should always be picked and not allowed to fall. In hot weather the fruit should be picked when nearly fully coloured, and should be placed in a sheltered place to cool off before being packed. In the cooler part of the season, the colouring of the fruit can be allowed to develop to its maximum before harvesting. By picking before the fruit gets heated, or by harvesting in the later part of the afternoon and allowing the fruit to stand and cool overnight the grower will have his fruit in an excellent condition for packing.

Close attention to the cooling is well worth while, assisting the fruit to carry longer distances and to arrive in better condition at the end of its journey. Stalks may be left on, but care should be taken to remove the dead part of the blossom that adheres to the stalk. This, when not removed, is a serious source of infection for mould development during transit over long distances. Shortening the stalks by clipping down to about a quarter of an inch in length when sending over long distances reduces to a great extent the risk of mould infection. Owing to the extra time and labour involved, it would possibly not pay to clip the stalks for local market as there possibly would be no gain in the price realised.

Care should be taken to avoid as much as possible damage to the fruit, which results from careless handling, causing rubbing of the skin, thereby greatly disfiguring the fruit. By paying due attention while packing, carefully tipping the fruit on to a bench (Plate 8) for packing, and not trying to pack from the picking containers, rubbing can be practically eliminated. Tip only one case of fruit at a time on to the bench as too much fruit on the bench leads to rolling the fruit about, causing damage to the skin. It is an advantage to cover the packing bench with bags. A simple bench can be made by making a frame and using sacks with fine netting fixed beneath to strengthen the sacks. Care should be taken to tilt the back of the bench so that fruit will always roll to the packer.

Grading.

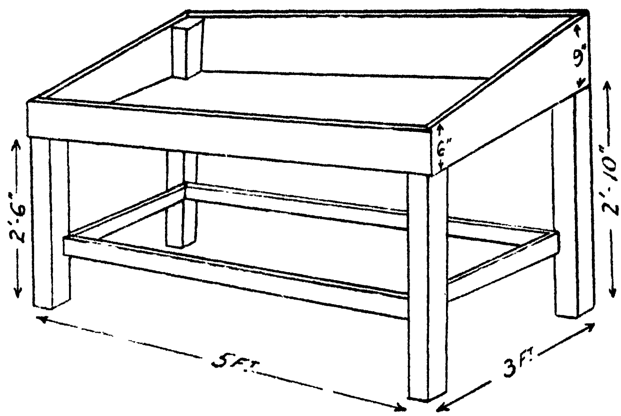
As the best prices are obtained for uncrinkled fruit, care should be taken to keep it from developing this trouble after packing. Keeping fruit in a cool place, and as dark as possible, helps to retard crinkling, for light and heat both have the effect of hastening the crinkling with subsequent loss in value. When marketing, it is suggested that growers adopt the terms "special," "standard," and "plain," for designating the grades of their fruit. As these terms are understood in the trade in the grading of other fruits, the buyers would soon become acquainted with their use for passion fruit. It is suggested that they be as follows:—

Special.—Large and medium sized fruit, full of pulp and free of dummy or blemished or diseased fruit.

Standard.—Large and medium sized slightly skin-blemished fruit, full of pulp and free of dummy or diseased fruit.

Plain.—Small sized fuit, and all sizes of crinkled and blemished fruit, such as limb marked or woody specimens free from dummy or diseased fruit.

"Special" and "standard" grades should be packed, but owing to the mixed sizes of the "plain" grade it would be very hard to make a pack with the possible small quantities of various classes of fruit placed in the "plain" grade. If all growers adopted this system, agents and buyers would soon understand the quality of fruit they were handling.



Fruit Bench to assist in Grading.

PLATE 8.—BENCH FOR HOLDING FRUIT WHILST PACKING.

Tip one case at a time to lessen the chance of damage to the fruit caused through it having to be rolled about to obtain the correct sizes for packing when more than one case is placed on the bench at a time.

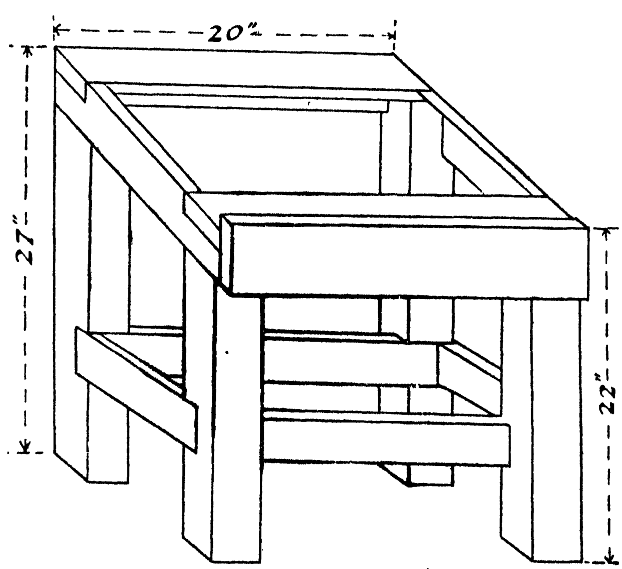


PLATE 9.—PACKING STAND TO HOLD TWO CASES.

Note the tilt on the stand which helps to hold the fruit in position whilst packing.

Grading can be done when picking. By having two picking containers and sorting the fruit into two qualities when harvesting, extra handling and rolling about on the benches, with its increase in damaged fruit, will be to a great extent avoided. A good system is to place all "special" fruit into one container, and "standard" and "plain" in the other, these two qualities being separated whilst packing. Care should be taken to eliminate all diseased fruit, dummies, or woody passions.

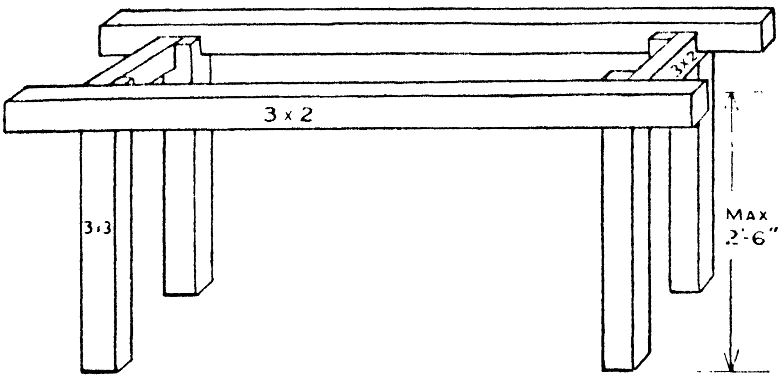


PLATE 10.—NAILING-DOWN BENCH.

This enables the bottom of the case to bulge slightly with the pressure of the fruit. This keeps the pack tight in transit, preventing the fruit from rubbing or becoming damaged.

Sizing.

Sizing is an operation that, to save extra handling with the risk of damage, is best carried out whilst packing. Three cases of "special" or "standard" grades can be packed at a time, and a fourth case for holding and specimens of "plain" grade found can be placed alongside the packer. This method saves handling and facilitates operations.

Shed Equipment.

A packing stand (Plate 9), a sloping bench approximately 5 feet by 3 feet (Plate 8), and a nailing-down bench (Plate 10) are all the necessary equipment in the shed.

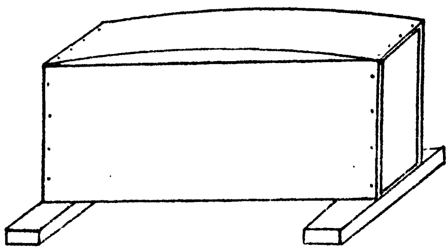
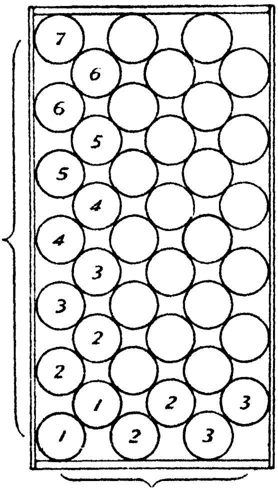


PLATE 11.—NAILING DOWN ON BATTENS.

Where a grower does not have a nailing-down bench, two pieces of 3 x 2 placed under the ends whilst nailing make a good substitute.

How to Read and Use the Packing Table.

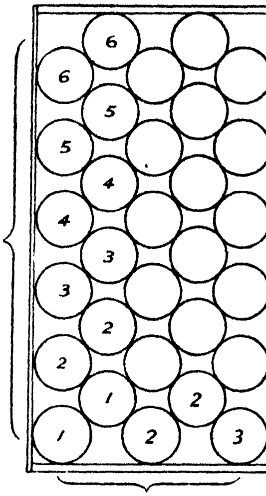
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 7 x 6.



3–3 Pack.

The Pack gets its name from the way the first six fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

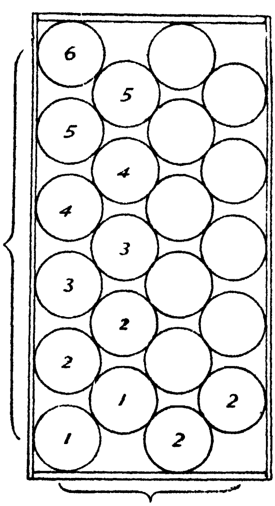
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 6.



3–2 Pack.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

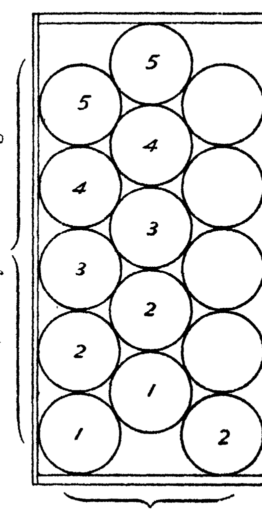
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 5.



2–2 Pack.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 5 x 5.



2–1 Pack.

The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

Plate 12.

Cases and "Get up" of Fruit.

The best type of case is one with close fitting boards. No lining paper is needed with a box of this description. Where the boards of the cases are apart it is advisvisable to use clean plain white or coloured paper, and line the cases. A thin layer of woodwool on the top and the bottom of the case is an added help in the good carriage of the fruit over long distances.

Many methods of packing have been tried. Rolling in, facing and square packing, but the diagonal pack is the best, having many advantages over all the other methods. Ease of packing and the enhanced appearance given by this pack are noticeable. Passion fruit packed on the diagonal system appear the same, whether top, bottom, or sides are opened for the inspection of the buyer, the straight lines up and down, diagonally, and across the case being very attractive. The straight lines in each layer are an indication of correct packing, the lines of fruit getting out of place when the operator is grading badly and packing incorrectly.

Another advantage is the numerical system of counts that can be used, the totals of the various packs never varying. As no individual fruit rests upon another, but must rest in the pocket formed by four fruits of the layer beneath, it can readily be seen that pressure crinkles are eliminated. The height of the fruit in the case is also very easy to regulate by opening or closing the pockets. With straight, faced, and rolled packs the regulating of the height of the fruit in the case is very difficult, this being the main reason of low and slack packs with the fruit being damaged through moving in the case. In the long half-bushel case (26 by 6 by 7½) the 2—2 pack does all the best commercial sizes, eliminating the trouble, experienced in straight packs, of trying to fit the fruit tightly across the case. The 3—2 pack is only used for very small fruit. The dump half-bushel case (18 by 8⅝ by 7½) uses the 3—3 pack, the 3—2 pack being used only for the very large fruit of the Mammoth type. Fruit should be packed to a height of ½ inch to ¾ inch above the top of the half-bushel box. It is not recommended to use bushel cases. Growers will possibly find that during periods of heavy supply it may not be profitable to pack the very small fruit.

The following ready reckoning table gives the types of packs and counts used in packing both kinds of cases.

Packs and Counts used to bring Passion Fruit to the Correct Height in the Half Bushel Dump Case and the Long Half Bushel Case.

Half Bushel Dump Case, 18 inches long, 8⅝ inches wide, 7½ inches deep.

Pack.	Layer.	No. of layers.	Total.	Count in dozens.
3—3	9 x 8	5	255	21 doz. and 3
3—3	8 x 8	5	240	20 doz.
3—3	8 x 7	5	225	18 doz. and 9
3—3	7 x 7	5	210	17 doz. and 6
3—3	7 x 6	5	195	16 doz. and 3
3—3	6 x 6	5	180	15 doz.
3—3	6 x 5	5	165	13 doz. and 9
3—2	7 x 7	4	140	11 doz. and 8
3—2	7 x 6	4	130	10 doz. and 10

Long Half Bushel Case, 26 inches long, 6 inches wide, 7½ inches deep, clear of division.

The packs and layer counts shown are for one compartment of the box, and the count is the total count for the whole box.

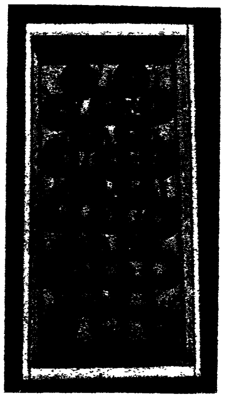
Pack.	Layer.	No. of layers.	Total.	Count in dozens.
3—2	5 x 5	6	300	25 doz.
2—2	7 x 6	5	260	21 doz. and 8
2—2	6 x 6	5	240	20 doz.
2—2	6 x 5	5	220	18 doz. and 4
2—2	5 x 5	5	200	16 doz. and 8
2—2	5 x 4	5	180	15 doz.
2—2	4 x 4	5	160	13 doz. and 4
*2—1	6 x 6	4	144	12 doz.
*2—1	6 x 5	4	132	11 doz.

* Instead of placing the fruit end for end with the case it is necessary to place the fruit across the case with the stalks turned inwards, otherwise the fruit will pack too low. (Plate 22.)

It is not recommended to pack passion fruit in bushel cases. The same packs with double the number of layers will bring the fruit to the correct height in the bushel case. (Plate 16.)

LONG HALF BUSHEL CASE. 3-2 PACK.

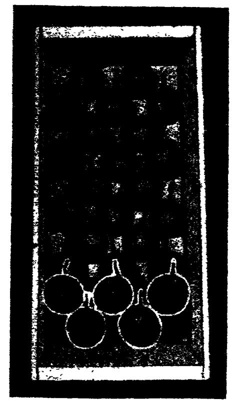
First Layer.



3-2 Pack. 5 x 5 Layer.

This layer starts with three passion fruit placed across the end of the case.

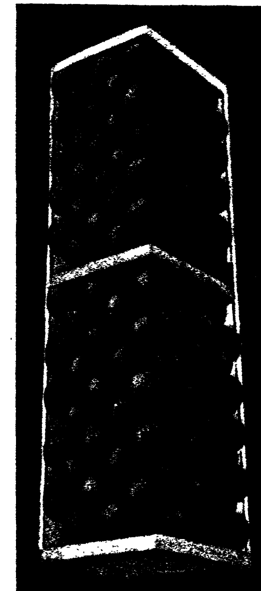
Second Layer.



This layer starts with two passion fruit placed in the two pockets between the first three fruit of the first layer.

Finished Case.

Top. Side.



3-2 Pack. 5 x 5 Layer.
6 Layers. Total 300.

Note the alignment of the fruit in the case.

PLATE 13.

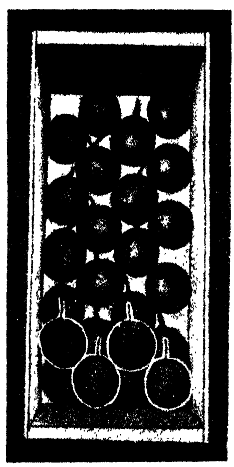
Packing the Long Half Bushel Case.

It will be found that the 3—2, 2—2, and 2—1 packs are used to pack the full range of sizes when packing in the long bushel case.

3—2 Pack.

This pack gets its name from the position in which the first five fruit are placed in the case, the first layer being started with three across the end (one in each corner and one exactly in the middle, see Plate 12). In the spaces between these three fruit two more are placed, thus forming the 3—2 from which the pack gets its name. This is repeated until the layer is finished. It will be noted that the fruit is placed in the layer with the stalks facing away from the wood of the case-end, until the last line is reached, when the stalks are placed away from the other end of the case by reversing the last two or three fruit. The second layer is then started by placing two passion fruit on the two cavities formed by the first three fruit of the first layer, the layer being finished by placing a passion in each of the spaces between the fruit of the first layer. Care should be taken to reverse the end line of fruit as in the first layer. The case is finished by repeating these layers. The 3—2 pack contains six layers. Care should be taken to keep the lines of three or two straight, and at right angles to the sides of the box. Fruit should be brought to one-half to three-quarters of an inch in height above the top of the case.

HALF LONG BUSHEL CASE. 2-2 PACK.
How to start the Second Layer.



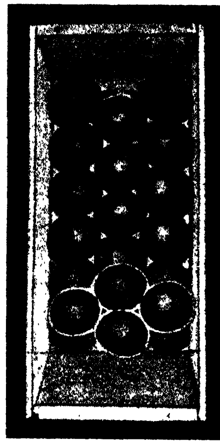
The second layer is started by placing two passion fruit on the pockets between the first two fruit of the first layer. The layer is completed by placing the fruit on the balance of the pockets.

PLATE 14.

2—2 Pack.

This pack is started by placing a passion fruit in the left-hand corner of the case and another midway between the edge of this passion and the right hand side of the box. In the two spaces between these we place two more passions. This gives the pack its name, 2—2 pack (see Plate 12). The same rule is adopted in placing the fruit as in the 3—2 pack, all stalks facing away from the packer, and fitting in the pockets with the last line reversed. The layer is finished by repeating the lines of two. The second layer is placed on the pockets of the first layer. (Plate 14.) The case is finished by repeating these layers, the finished case containing five layers. Care should be taken to keep the lines of two at right angles to the sides of the case. Three-quarters of an inch above the top of the case is the correct height for the fruit to be packed.

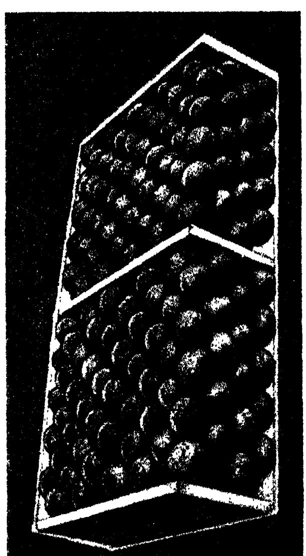
2-1 PACK.
How to start the Second Layer.



The layer is started with one fruit placed in the pocket between the first two fruit in the first layer.

PLATE 15.

LONG BUSHEL CASE.
Finished Pack.



2-2 Pack. 5 x 5 Layer. 10 Layers. Total 400.

Packs in this case are the same as in the half-bushel, but have double the number of layers. It is not recommended that the bushel should be used, the trade desiring the half-bushel for preference.

PLATE 16.

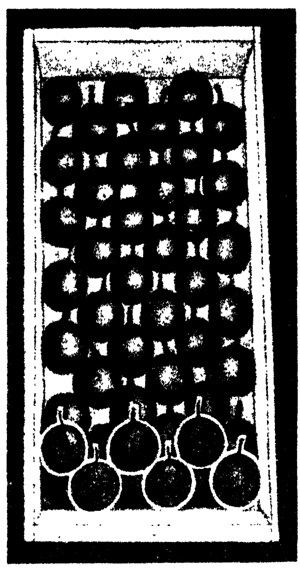
2—1 Pack.

This pack is different from the others in the fact that the fruit, instead of being placed end for end in the case, is placed across with the stalks turned inwards. The first layer is started by placing a passion fruit in each corner of the case, and one in the space between, forming the 2—1 pack from which the pack gets its name (see Plate 12). This is repeated until the layer is finished. The second layer is started by placing one passion on the space between the two first fruits of the bottom layer, then two, finishing the layer by placing fruit on the pockets of the first layer (Plate 15). This system of packing is continued layer by layer until the case is full, four layers being necessary to fill the case. This pack, owing to the smaller pockets, will not come as high above the top as the other packs, half an inch being a sufficient height.

The Dump Half Bushel Case.

Practically all sizes of passions can be packed in this case by using the 3—3 pack, only the very large fruit requiring the 3—2 pack.

HALF BUSHEL DUMP CASE. 3—3 PACK.
How to start the Second Layers.



3-3 Pack.

The second layer is packed by placing three passion fruit on the pockets of the first layer, repeating this line by line of fruit until the layer is complete.

PLATE 17.

3—3 Pack.

This pack is very easy to do, providing care is taken in placing the first six passion fruit in the first layer. These are placed in a layer of three across the end of the case, placing the first fruit in the left-hand corner and spacing the other two equal distances apart between the corner fruit and the right-hand side of the box. This leaves three even spaces between the fruit in which we place the next three passions, forming the 3—3 from which the pack gets its name. (Plate 12.) Care must be taken to place the fruit in straight lines at right angles to the side of the box. The layer is then completed by placing lines of three in the spaces left between each line of fruit until the end of the case is reached. The fruit is placed facing the same as the 3—2 and 2—2 packs in the long half bushel, the same care being necessary in reversing the last three across the case. The second layer is placed upon the pockets of the first layer (Plate 17). Three-quarters of an inch above the top is the correct height for this pack.

3—2 Pack.

This is done in the same manner as the 3—2 in the long half bushel, with the difference that there are only four layers in the dump half bushel instead of six as in the long half bushel. Half to three-quarters of an inch is the correct height above the top for the fruit in the finished case.

Faults are easily noticeable. If any of the straight lines in any of the packs become crooked or the fruit loose in the layer it is a sign that the pack is going wrong, usually through bad sizing. A thin layer of woodwool top and bottom is an improvement to the pack, especially for long distance transit.

HALF BUSHEL DUMP CASE, 3-2 PACK.
How to start the Second Layer.

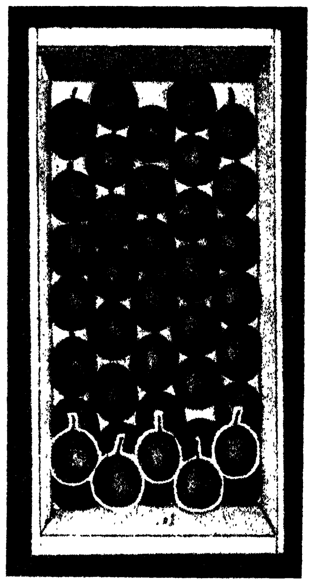


PLATE 18.

Note the alignment of the fruit in the case, also that no fruit rests one upon the other but in the pockets of the layer beneath.

The following rules are a good guide to successful marketing:—

1. No two passions should rest directly one upon the other but should rest in the pockets of the first and subsequent layers.

2. See that fruit comes to the correct height in the case, at least a minimum height of one-half to three-quarters of an inch being necessary.

3. See that all lines appear straight, across, from end to end, and diagonally in the case.

4. Keep all crinkled and woody passions out of top grades.

5. Handle carefully and eliminate skin rubbing.

6. See that the 2—1 pack has the fruit placed across the case and not end for end as in other packs.

Cases.

Cases should be made with close-fitting timber. Lining paper should be used, as passion fruit do not crinkle as quickly if the fruit is kept cool and not exposed to light and air. Clean plain white or coloured paper should be used, being preferable to the use of newsprint, which is cheap and looks it. If the weather is hot whilst packing, damp bags placed on the packed cases will assist in keeping the fruit cool and will retard cringling.

Branding.

To conform to the Fruit and Vegetables Act growers must brand the end of the case legibly with the name of the variety of fruit and their name and address in a space measuring 5 inches by 2 inches. The number of dozens or total fruit in the case should also be stencilled on the end. It is suggested that the number of dozen is the best system of stencilling to use. When exporting overseas it is necessary that the address of the grower contains the word "Australia."

Growers using fancy labels should see that the word "Australia" is included in the address on the label.

Export Packing.

There is the prospect of a market to be obtained outside of Australia. Passion fruit does not store in the refrigerator as satisfactorily as some other fruits, but with care a safe storage period of a month to five weeks can be assured. Fruit when being shipped should be pre-cooled before being placed in the ship's refrigerator. The same packs as when unwrapped are used for the fruit for export, but each fruit should be wrapped in sulphite tissue paper, as this isolates each unit from possible infection from one another if infected with mould. Care should be taken to see that all stalks are cut short before packing as this helps to eliminate the possible infection from moulds. A thin layer of woodwool top and bottom is necessary. Passions packed in this way should carry satisfactorily to America and Eastern markets. Care should be taken to see that only first-quality fruit is packed for export consignments. Fruit must not be allowed to fall or become fully ripe, but should be harvested when mature though not fully coloured. Tests conducted in Victoria by the Department of Agriculture have shown that fruit picked from pruned vines is superior in every way for exporting over long distances to fruit from unpruned vines.

Wrapping.

The fruit is wrapped by placing it in the centre of the sheet of wrapping paper, gathering all the corners together, giving the fruit a twist, and folding the finished ends on to the cheek of the fruit. This forms a pad on which the fruit is rested when placed in the case, the pad in the second and subsequent layers in the case resting in the pockets of the layer beneath. Care is necessary to see that the fruit is wrapped with the shiny side of the paper to the outside.

Hints for Successful Export.

1. Harvest fruit in the cool part of the day and keep as cool as possible during handling.
2. Pre-cool before loading into ship's hold.
3. Clip stalks to avoid mould (*Cladosporium herbaram*) infection.
4. Wrap each fruit, and place woodwool on top and bottom. As wrapping paper is used there is no necessity for lining paper.
5. Handle with care and as little as possible to eliminate damage to the skin.
6. Do not pack fallen or over-matured fruit.
7. Use the half bushel dump case and see that the boards are close fitting.

Nailing Down.

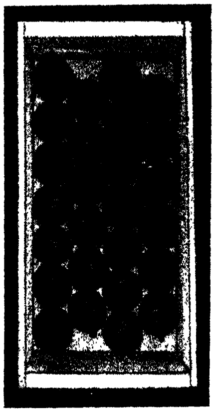
When nailing down battens should be placed beneath each end of the case to permit the bottom to bulge if necessary when applying the lid. A nailing-down stand can be made of two lengths of 3 by 2 placed edgeways and fastened 15 inches apart for the dump half bushel case, or 21 inches apart for the long half bushel case (see Plate 10).

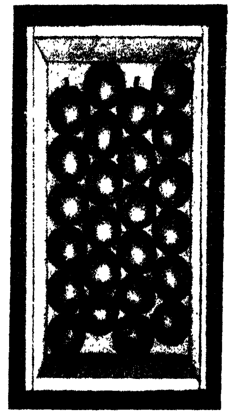
This can be made to go on a bench top or can be made with legs as a separate nailing-down bench.

Acknowledgment.

I desire to thank Messrs. Anderson and Woolcott and J. Bishop, of Mount Tamborine, for allowing me to pack and photograph their fruit for this publication.

LONG BUSHEL CASE. 2-2 PACK.
First Layers.

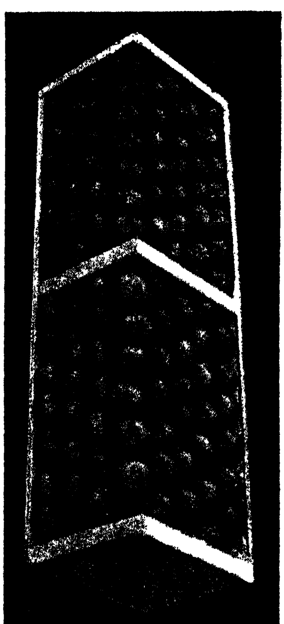


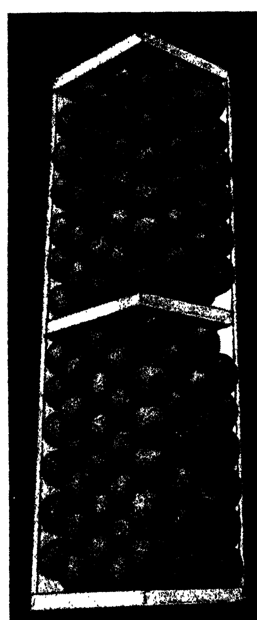


2-2 Pack. 7 x 6 Layer. 2-2 Pack. 6 x 6 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Top. Side. Finished Cases. Side. Top.





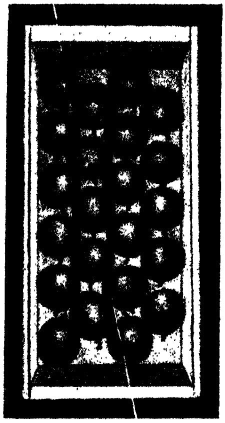
2-2 Pack. 7 x 6 Layer.
5 Layers. Total 260.

2-2 Pack. 6 x 6 Layer.
5 Layers. Total 240.

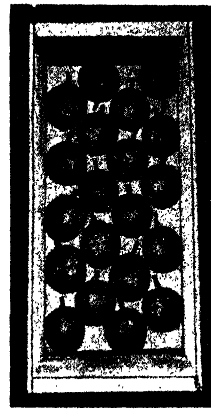
Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 19.

LONG BUSHEL CASE. 2–2 PACK.
First Layers.



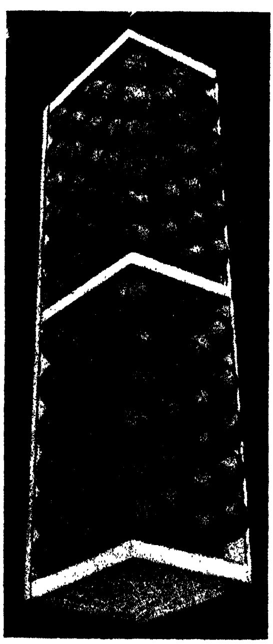
2–2 Pack. 6 x 5 Layer.



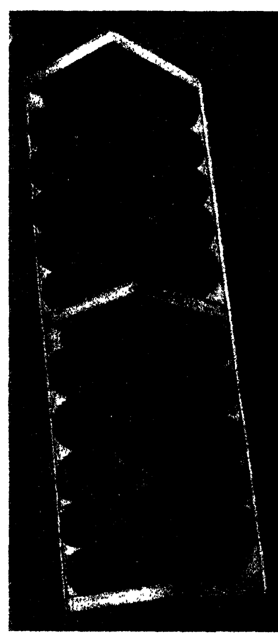
2–2 Pack. 5 x 5 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Side. Top. Finished Cases. Top. Side.



2–2 Pack. 6 x 5 Layer.
5 Layers. Total 220.

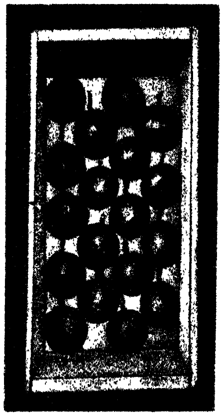


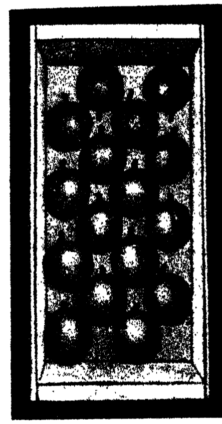
2–2 Pack. 5 x 5 Layer
5 Layers. Total 200.

Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 20.

LONG BUSHEL CASE. 2-2 PACK.
First Layers.

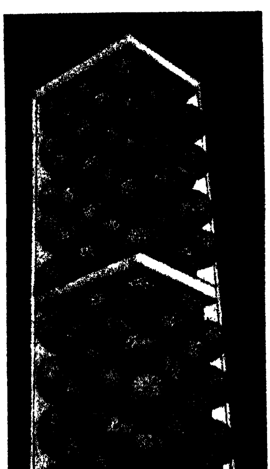


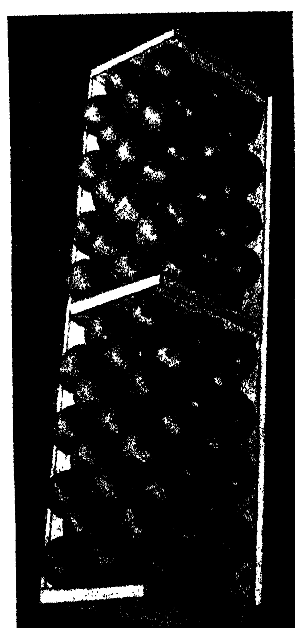


2-2 Pack. 5 x 4 Layer. 2-2 Pack. 4 x 4 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Side. Top. Finished Cases. Top. Side.





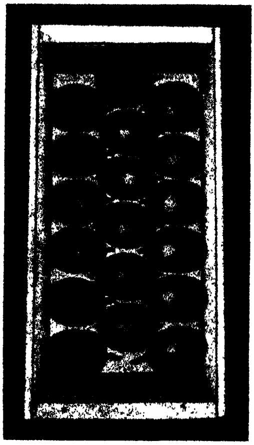
2-2 Pack. 5 x 4 Layer.
5 Layers. Total 180.

2-2 Pack. 4 x 4 Layer.
5 Layers. Total 160.

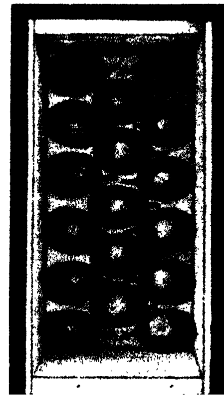
Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 21

HALF LONG BUSHEL CASE. 2–1 PACK.
First Layers.



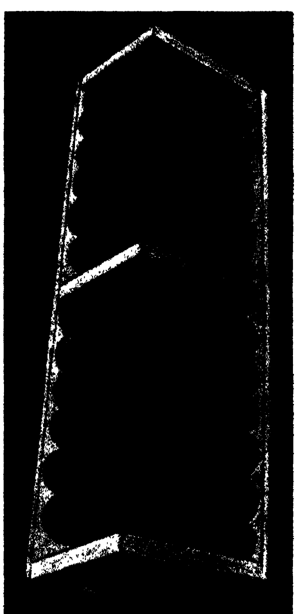
2–1 Pack. 6 x 6 Layer.



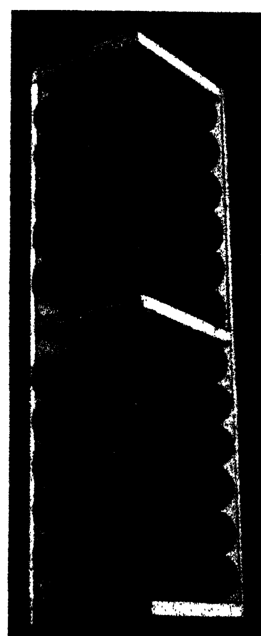
2–1 Pack. 6 x 5 Layer.

NOTE.—The fruit in this pack is placed across the case and not end for end as with all the other packs.

Top. Side. Finished Cases. Top. Side.



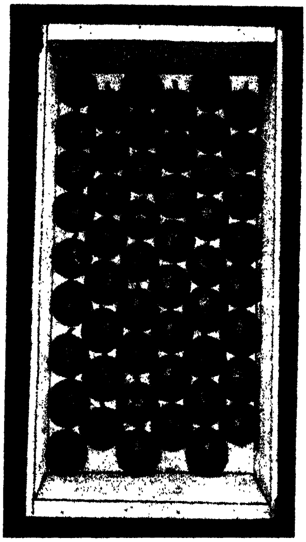
2–1 Pack. 6 x 6 Layer.
4 Layers. Total 144.



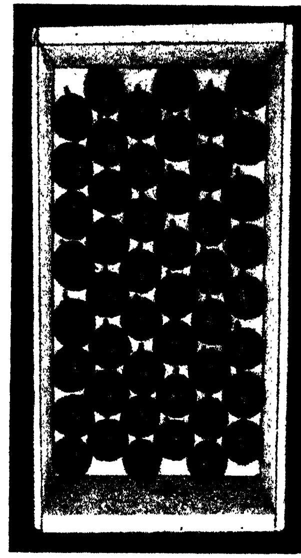
2–1 Pack. 6 x 5 Layer.
4 Layers. Total 132.

PLATE 22.

HALF BUSHEL DUMP CASE. 3–3 PACK.
First Layers.

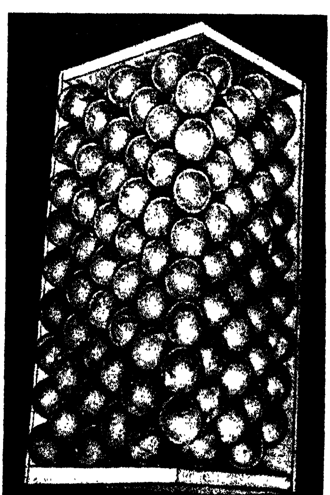


3–3 Pack. 9 x 8 Layer.

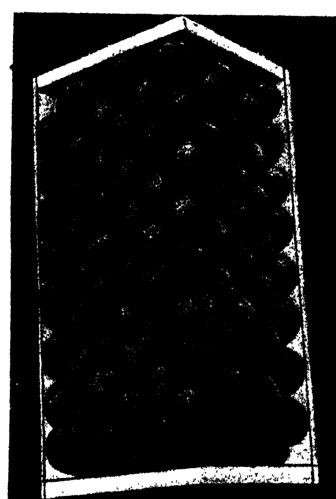


3–3 Pack. 8 x 8 Layer.

Top. Side. Finished Cases. Top. Side.



3–3 Pack. 9 x 8 Layer.
5 Layers. Total 255.



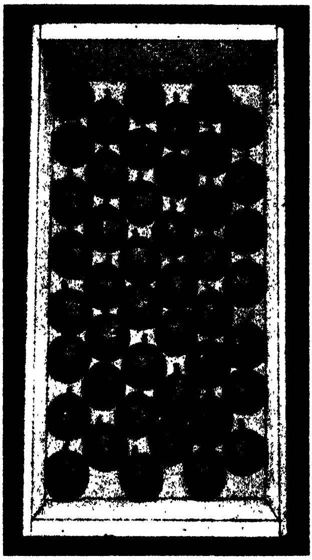
3–3 Pack. 8 x 8 Layer.
5 Layers. Total 240.

Note the alignment diagonally, across, and up and down the case.

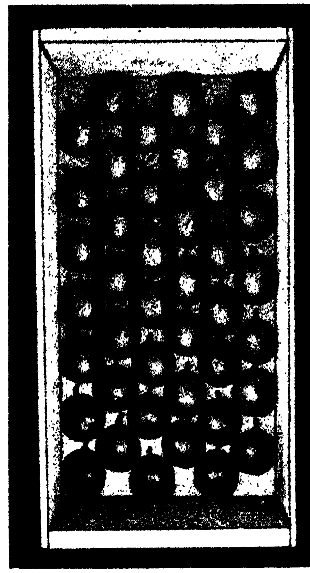
PLATE 23.

HALF BUSHEL DUMP CASE. 3-3 PACK.

First Layers.

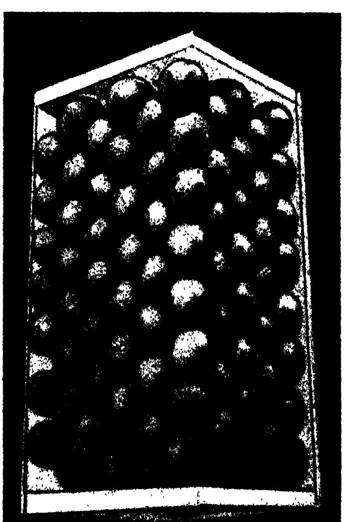


3-3 Pack. 8 x 7 Layer.

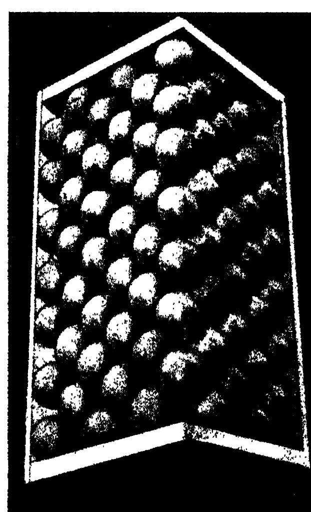


3-3 Pack. 7 x 7 Layer.

Top. Side. Finished Cases. Top. Side.



3-3 Pack. 8 x 7 Layer.
5 Layers. Total 225.



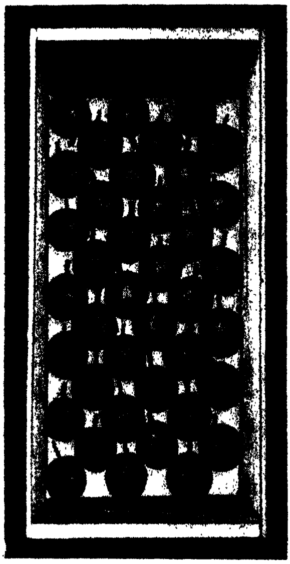
3-3 Pack. 7 x 7 Layer.
5 Layers. Total 210.

Note the alignment diagonally, across, and up and down the case.

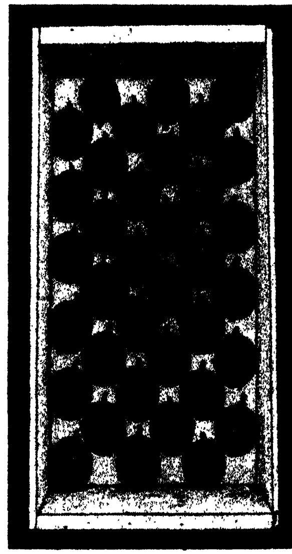
PLATE 24.

HALF BUSHEL DUMP CASE. 3-3 PACK.

First Layers.

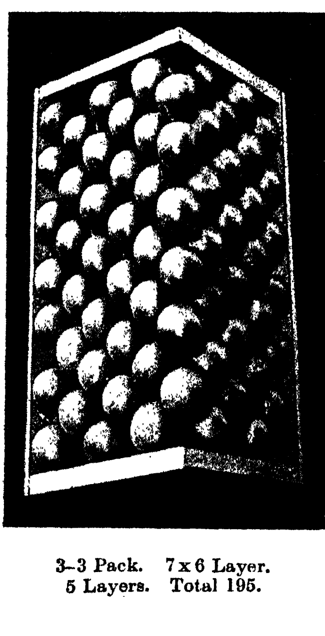


3-3 Pack. 7 x 6 Layer.

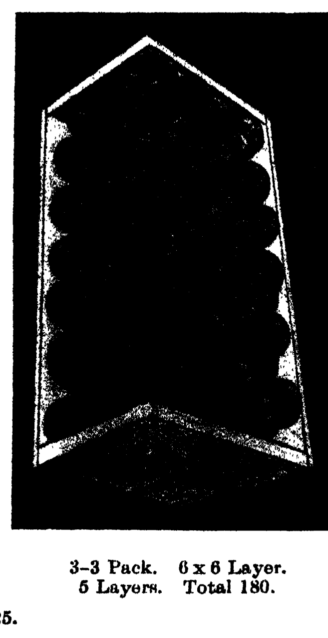


3-3 Pack. 6 x 6 Layer.

Top. Side. Finished Cases. Side. Top.



3-3 Pack. 7 x 6 Layer.
5 Layers. Total 195.

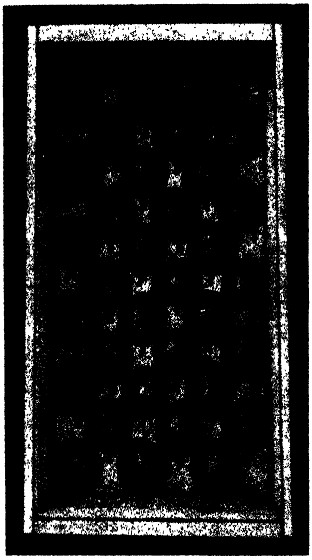


3-3 Pack. 6 x 6 Layer.
5 Layers. Total 180.

PLATE 25.

HALF BUSHEL DUMP CASE. 3-3 PACK.

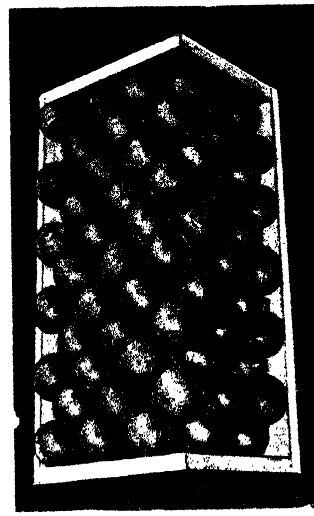
First Layers.



3-3 Pack. 6 x 5 Layer.

Finished Case.

Top. Side.

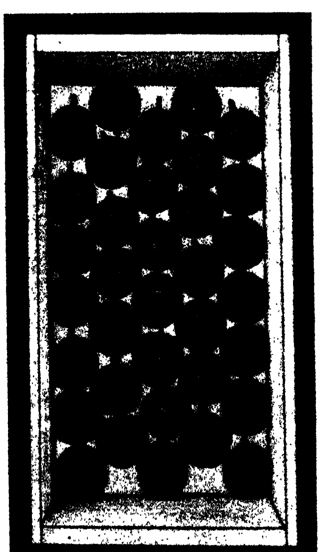


3-3 Pack. 6 x 5 Layer. 5 Layers.
Total 165.

PLATE 26.

HALF BUSHEL DUMP CASE. 3-2 PACK.

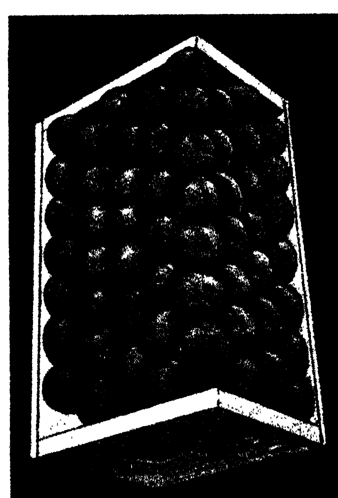
First Layer.



3-2 Pack. 7 x 7 Layer.

Finished Case.

Top. Side.



3-2 Pack. 7 x 7 Layer.
4 Layers. Total 140.

PLATE 27.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

(*Continued from the March issue.*)

PART IX.

This is the ninth article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising in Queensland on relatively small holdings.

CLASSING THE CLIP.

THE high standard of woolclassing attained in Queensland has created confidence and a feeling of security among wool buyers. It is necessary that this standard should be maintained by small as well as large flockmasters. The big stations usually have flocks sufficiently numerous to justify the employment of a qualified classer. It is really the get up of these clips that has gained for us the high reputation which the wool business now enjoys. It is to the small flockowner who does not usually employ a classer that I wish to direct my remarks. Every sheep farmer knows that from a sheep there will be shorn a low grade of wool as well as the good, clean fleece wool. To keep these grades separate is very important, but first consideration should be given to the matter of general cleanliness. Have a good clean shearing board of a size suitable to requirements and keep it clean. When a sheep is shorn the fleece should be picked up and thrown out, cut side down on the wool table for skirting.

Skirting the Fleece.

In the best of fleeces there is a falling away of length and quality along the outside edge or skirt of the fleece, as it embraces the wool from the legs and the points running out to the bare parts, also the fatty edges and stained portions. Usually fleeces will be met with in one of three classes, and all the fleeces from one flock will be practically the same. Firstly, it may be free from seed; secondly, the edge only may carry seed; thirdly, the seed may extend well up the sides, leaving only the portion along the back free. No. 1 will need but a light skirting, merely removing all short, matted, fatty, or heavy conditioned wood as well as the stained portions, which should be removed from all fleeces. No. 2 is a fleece lightly seeded, from which the whole of the wool carrying seed should be removed, thus giving a heavy skirting, especially on the front portion and flanks. No. 3 is a fleece that carries seed up the sides, and making it free would mean removing the best of the body wool into the pieces, leavng very little more than the back wool, which is usually not up to the standard of the rest of the fleece wool. It is advisable to skirt lightly, just removing the heavy burry or seeded points, fatty edges, and stains.

By placing a basket at each end of the skirters' table the wool from the breech end may be placed in one, and that from the sides and the neck in the other basket. In following this system it will be found that all stains will be placed in the basket at the breech end, hence the necessity for picking up and throwing out properly. After the fleece is skirted it should be rolled. Where the pressure of work is great a very slack method is often adopted, but to do it properly one-third of the side should be turned in the full length of the fleece, then the same side folded in again. This will expose the back wool in full length. Then turn in the one-third that is left at the other side of the fleece; and turn in the neck and roll from the breech. When rolled (Plate 28) the side and shoulder wool, which should be the best wool of the fleece, will be exposed, while the back wool will be in the centre.

Another method and one which I favour for treating the fleece where small flocks are shorn is to sort each class of pieces from the fleece before rolling; thus—first remove all stained wool, then skirt the fleece placing each class in separate baskets, making the classes according to skirtings as described later.

The fleece should then be placed on the classer's table, which should be sufficiently large to hold thirty to forty fleeces when they may be classed into as many classes

PLATE 28.—FLEECE SKIRTED AND ROLLED.

as decided by the classer, who should have a thorough knowledge of his work, the type of sheep and number in the flock, and the requirements of the trade.

When the baskets are full of skirtings they should be emptied on to the piece picker's table, which should be placed against some convenient wall. The contents of each basket should be kept separate, for it saves much time in sorting the pieces.

The Skirtings.

Skirtings should contain the following sorts:—Broken pieces, which will be the brightest, lightest, longest, and most free from vegetable fault, taking in most of the neck wool, if it does not contain too much moits or sticks. The size of the flock decides to a great extent the number of classes. First pieces, closely allied to brokens. If the quantity does not warrant making brokens they may come under this heading, when the sort will contain all the best and brightest from the skirtings. Second pieces should contain all the shorter and heavier conditioned after the first are taken out. Stained pieces should contain all heavy fatty ends and stained portions from the skirtings and bellies after all dags are removed.

Locks.

Locks are the bitty pieces, second cuts, and small portions that fall through between the laths of the wool tables. They should have foreign matter removed, also dags.

There is always a mixture of pieces, trimmings, locks, &c., on the shearing board, which should be kept swept up after the fleece is picked up. These sweepings should be run over the piece picker's tables where the breech ends are sorted. They will then work in with either pieces, stains, or locks.

Bellies.

The fatty ends and stained portions should be removed and the bellies packed separately. If in large lots, they should be classed into two sorts. In any case they should be trimmed up to free them from stains.

Classing the Fleece Wool.

The requirements of the trade must influence the decision of the classer in bulking his sorts. When classing the fleece wool, consideration must be given to the number of sheep to be shorn, and the number of sorts made accordingly in order to get the best results. A bulk line consists of five bales or over, which will be submitted to auction, where it is sold under the competition of all buyers. A long bulk line of wool from the one owner usually meets with a better demand than do short bulk lines of several owners of the same quality; still both are sold catalogued in bulk lines. It is, therefore, easy to realise the advantage of having long lines, but when it comes to star lots, that is four bales and under, the disadvantage of selling under those conditions is very marked, as the price is influenced first from being a short line, and second that there is not the same keen competition from the different buyers. For the classer to follow on fixed set lines is impossible when classing the fleece wool. Each class to be made should be of a given standard with the idea of getting it into a bulk line, and this standard once established should be maintained until the whole of the wool from the flock is allotted to the different classes.

As a sufficient quantity becomes available it should be pressed and its distinguishing class and number put on, and then passed on to the brander, who marks the bales with the owner's brand, the class of wool it contains, showing a distinguishing mark for breed and probably sex. Rams' wool, weaners and lambs should be kept separate and branded accordingly. Each bale should be numbered carefully and booked up according to specification to forward to the broker for entering up in his sale catalogue.

Three chief factors are taken into account by the buyers when coming to a conclusion on the value per lb. of greasy wool—namely, spinning qualities, length of fibre, and yield.

Terms Used in Classing.

When classing a clip of, say, 2,000 merino ewes, the following classes should be made from fleece wool:—

AAA.—This class should contain all long, bright, light-conditioned wool of good quality, sound enough to stand the strain of the combing machines. Any wool too bold and strong for this class of a 60s count should be placed in AAA combing.

AA.—Shorter than the foregoing. It can be more irregular in length, colour and quality, fair in yield.

A.—This class should contain all the heavy-conditioned low-yielding fleeces.

Any fleeces carrying too much condition or badly bred or matted should be broken up and put into the piece lines in order that they do not reduce the value of the good bulk lines of fleece wool. A properly prepared clip should carry even and regular lines throughout.

Classing Crossbred Wools.

Owing to the distinct variations in the crossbred wools it is necessary that each class be as even as possible in the spinning quality. The same consideraton regarding bulk lines must be given as when classing merino. The greater the number of sheep to be shorn the more thorough the classing should be.

AAA Crossbred.—All the fine crossbred wool sound, of good colour, and light condition, all wool 3 inches or over, should be embraced in this class, spinning counts 56s.

AA Crossbred.—The balance of the long wool of lower-spinning quality, sound, and of fair colour and yield, 48s to 54s spinning counts.

A Crossbred.—All fleeces too coarse for the foregoing classes.

Pieces Crossbred.—In sorting crossbred pieces, if they range from fine to coarse, it is best to make two lines, calling the fine line first piece crossbred and the coarse sort pieces crossbred. Bellies, stains, and locks are treated in the manner indicated for merinos.

Comeback Wool.

This is a valuable class and should be classed carefully, thus: AAA should contain all the well grown light-conditioned fleeces of 58s-60s quality. AA Comeback should embrace the heavier-conditioned wool of fair length, and may be straighter and coarser. A Comeback.—Short, irregular coarse and heavy-conditioned comeback wool. Pieces Comeback.—These may vary to some extent and should be treated according to quality and length if the quantity is great enough, or they may be placed in either the merino or crossbred pieces according to their quality, in order to reduce the number of classes.

The Wool Room.

To keep the wool clean from the time it is shorn until baled up is a matter of great importance. From the shearing board to the wool press the floor should be kept clean. After each sheep is shorn the floor should be swept and no accumulation of dirt or dust allowed in any part of the wool room.

Classing Merino Lambs' Wool.

Each fleece of lambs' wool should be brought on to the table separately. The roller table should be covered with hessian, as the lambs' wool does not hold together and too much would fall through the screen. Each fleece is sorted and put direct into the basket according to class. The longest and brightest wool, if free from seed, should be placed in the top line and branded AA Lambs, and the shortest and heaviest conditioned sort in the second line and branded A Lambs. All burry or seedy wool should be kept separate and branded Lambs.

The three chief points to be considered when sorting lambs' wool is length, quality, and condition.

Crossbred Lambs.

Much the same process is followed in sorting crossbred lambs, the number to be shorn to be the deciding factor.

Trade Definitions.

Combing.—Signifies that the wool is of sufficient length to be combed, and sound enough to withstand the tension of the combing machine (2 inches and over).

Tops.—After the wool goes through the combing machine and is freed of all weak and cross fibres it is delivered as top or sliver, when all fibres are lying parallel to each other.

Noil.—The weak and cross fibres combed out of the wool in the process of combing.

Clothing.—This term denotes that the wool is short, fine, and possessing good felting properties. It goes through the carding machine just the reverse of the combing process.

Quality in Wool.—This means a combination of fineness according to breed; it must be bright, soft, elastic, kind to the touch, sound and true.

Character.—This term means the general character of the wool of any breed; it is closely allied to quality. Character in merino wool indicates an even crimpy formation, bright white in colour, soft and true to the character of that breed. Character in Lincoln is based on its length of staple, and must be full, bold, massive, and the crimps of a wavy nature lustrous in colour.

Sound.—This term signifies that a staple of the fleece will stand sufficient tension to allow it to be combed without losing too much in noil. It is a very valuable and necessary quality in merino wool over 2 inches in length.

Strong.—This term should convey a different meaning to the term sound, as it means the actual diameter of the fibre and may not necessarily be sound.

Tender.—This term means that the staple will not stand the tension necessary in combing.

A Break.—This term means that the wool will break in a given place. Both above and below the break may be quite sound.

Staple.—This term means a combination of fibres formed into a natural body during growth and bound together by binders. It is by these staples the wool is tested and classed for soundness.

Crimp.—This is the name given to the wave in the fibre. The wave proper is found in long coarse wools, such as in the Lincoln and Leicester, while the merino shows a distinct crimp. The greater the number of crimps per inch the finer the wool as a general rule.

Serrations.—These are the notched edges on the fibre, and are invisible to the naked eye. The finer the wool, the greater the number of serrations per inch. It is the great number of serrations in a fine merino wool that makes it so valuable for felting purposes.

Condition.—This is a term used when describing wool as to quantity of yolk—i.e., light or heavy condition, good or bad condition.

Yolk.—This is a greasy substance secreted by the skin. Its function is to lubricate the fibres and prevent them from felting as well as preserving the wool against severe climatic conditions. It is one of the chief characteristics of wool, and varies greatly according to the breed of sheep.

Yield.—The percentage of clean dry wool after yolk and all foreign matter has been removed by scouring. Yield is a very important factor in determining the value of greasy wool. To determine the yield, multiply the scoured weight by 100 and divide by the greasy weight. *Example.*—A parcel of greasy wool weighs 8,550 lb., when scoured it is reduced to 4,104 lb. Thus $\frac{4{,}104 \times 100}{8{,}550} = 48$. Yield of scoured product, 48 per cent. All greasy wools are bought on their yield of the clean scoured product. Yield as applied in this respect is illustrated thus. A line of wool is estimated to yield 48 per cent., the clean value of which is 42d. per lb. Thus the greasy cost will be $\frac{48 \text{ per cent.} \times 42\text{d.}}{100} = 20.16\text{d.}$ per lb.

Bale.—A bale of greasy wool should weigh 200 lb. gross.

Butt.—A bale below the standard weight.

Badge.—An irregularly-shaped pack not in shipping order.

Draft.—One pound of wool in every cwt. must be allowed by the seller to the buyer.

Tare.—The weight of the pack or container deducted from the gross weight.

Carbonising.—A seedy class of wool which must go through the process of carbonising to get it free.

Wool Classing.—This means the grading of whole fleeces into different classes, each class or grade to be as near as possible in length, soundness, colour, condition, and quality.

Wool Sorting.—This means the dividing of the fleeces into as many grades as it contains. No fleece is left whole, but is separated according to length, soundness, and spinning quality. Portions of the different fleeces are put together and called matchings.

Count.—This is a necessary term used by the manufacturer of worsteds to indicate the number of hanks of 560 yards that is spun from 1 lb. of combed top.

Spinning Quality.—This means the actual length of yarn that can be spun from 1 lb. of combed top. Five hundred and sixty yards of spun yarn makes one hank, one hank equals one count; thus, a wool of 60s counts × 560 yards equals 33,600 yards of spun yarn.

[TO BE CONTINUED.]

REPORTED PARALYSIS IN SHEEP.

By J. L. HODGE, Assistant Instructor in Sheep and Wool.

DISTRICT Stock Inspector Tannock, of Charleville, recently reported to this office a state of "paralysis" in sheep and suggested that a sheepman from this office and a botanist investigate on the spot. As a consequence, acting under instruction, I, accompanied by Mr. Francis (Botanist) left Brisbane on Friday, 1st April, for Charleville.

Complete arrangements had been made by Mr. Tannock, and an itinerary prepared which enabled us to see most of the stock affected and the properties on which same had grazed when in that state.

A first visit was made to a property 70 miles north of Charleville. Here the external symptoms were as follows:—A disinclination to travel, and if forced, inability to rise. After a considerable period, a sheep can get up, but will again go down if forced, a very pronounced hump in the back and a general lack of muscular cohesion. Deaths may occur in the paddock to some slight extent, but, generally speaking, it is the forcing of a flock which leads to mortality. It is quite possible that the trouble would not be noticed in some cases unless the sheep were disturbed.

In the case of wethers a urine scald is noticeable and there appears a difficulty in urination.

Post-mortems were carried out and the internal symptoms were as follows:—The bladder is not normal, but conditions differ somewhat. In some cases the bladder is over full and distended and the urine is practically colourless. In other cases the bladder contains very little urine. When this occurs the liquid is very cloudy and thick and slight blood stains are noticeable. In both cases there is evidence of a derangement of the urinary system. The kidneys, or rather one kidney, has in some cases been found affected with a dark patch. In no cases have both kidneys been affected. The heart is normal.

In the case of every sheep killed, the lungs are more or less congested. I do not attribute the disease to this symptom, but am under the impression the congestion is caused by straining and struggling after the malady has made its appearance. This would appear to be borne out by observation of the sheep which have been affected and have then recovered.

As in former cases met with (see previous reports Maranoa district), and examination of the stomachs reveal the following:—The first stomach was normal and full, likewise the second stomach, the bible or third stomach appears to have functioned properly. In one case only was there any suggestion of dryness. The fourth stomach, in every case examined, instead of containing a green fluid, is inclined to be dry and empty. This stomach is not functioning as it should. Inflammation commences in the entrails immediately joining the fourth stomach, and in some cases extends several feet along the gut. Occasionally there are blood stains to a greater or lesser extent. No worms of any description were found in the sheep on this property. Oestrus ovis (nasal fly) was also absent in the sheep killed.

District Stock Inspector Tannock agrees with me that the trouble is dietetic.

The assistance of Mr. Francis (Botanist) was therefore sought in the search for a weed or plant likely to have the effect described.

Three plants in all came under suspicion—viz., one species of Sida corrugata, Malvastrum specimen, and Solanum. (For full botanical report see separate report by Mr. Francis.)

On every property visited where there were affected sheep, one or all of these plants were encountered, and it was noticeable the extent to which they had been eaten, even in preference to good grasses. All three plants are regarded by Mr. Francis with suspicion, and I am of the opinion that, taken in quantity and under certain seasonal conditions, one or all of the suspected plants may have been the cause of the gastro-enteritis found.

This theory would appear to have support from the fact that on one property at least the owner definitely stated, when shown the suspected specimens, that in two paddocks on the run where there had been no trouble, the plants complained of did not exist.

Wagstaff's non-poisonous drench has been found effective, and pending further research by officers of this Department, I advise its use. Two fluid oz. per day whilst down.

In further support of the gastro-enteritis diagnosis I mention the fact that the ailment is always at its worst during extremely hot weather, provided good rains have preceded the heat. Although only reported to the Department this year, the sickness has been known in the Charleville and Cunnamulla districts for a number of years. In the past no great losses have occurred. I have formed the impression that the malady is likely to be purely seasonal. Extremely hot weather following heavy rains seems to be the condition under which the sickness is at its worst. The eradication of the suspected plants is impossible.

In all eight properties were visited covering an area of country situated from 70 miles north of Charleville to a considerable distance west and east of Cunnamulla and embracing also the Wyandra district. Symptoms and pastures (as far as the suspected plants are concerned) were sufficiently alike to pronounce the sickness identical on all properties visited.

Report by W. D. FRANCIS, Assistant Government Botanist.

From the 4th to the 10th April I accompanied Mr. Tannock, Inspector of Stock, and Mr. Hodge, Instructor in Sheep and Wool, on an inspection of some of the country in which the sickness in sheep occurred.

Messrs. Tannock and Hodge, as a result of their inquiries, formed the opinion that the sickness was due to something that the sheep had eaten. It was my duty to examine the country in an endeavour to locate any plants which could be connected with the symptoms shown by the sick sheep.

It was learned from stockowners and stockmen that the sickness generally manifested itself when the sheep were driven, and that it was rarely seen in animals which were not moved about.

When they become affected the sheep arch their backs and move with a peculiar gait. In later stages of the complaint they are unable to move and appear to be paralysed in the limbs. Most stockowners were of the opinion that fat sheep were more prone to be affected than others. In one instance a stockowner stated that young lambs contracted the sickness on his property.

The behaviour of the sick sheep as outlined is similar in several respects to the symptoms described by Dodd and Henry in the disease shown as "staggers" or "shivers" (Science Bulletin 23, Dept. Agriculture, N.S.W.). It is especially to be noted that the symptoms rarely appear until the sheep are driven. This characteristic is a feature of "staggers" or "shivers," and was emphasised by the stockowners at Charleville and Cunnamulla in describing the present malady in their districts. A Malvaceous plant (*Malva parviflora*) was found by experiments to produce the symptoms of "staggers" or "shivers" in sheep in New South Wales. It is somewhat significant that two Malvaceous plants (*Sida corrugata* and *Malvastrum spicatum*) are very common and abundant constituents of the herbage in the areas where the sheep were affected in the Charleville and Cunnamulla districts. These two plants were also very extensively eaten in those areas. There is, therefore, reason to suspect that these plants may be the cause of the sickness of the sheep,

although proof of this suggestion is lacking. The suggestion is based upon the similarity of the symptoms in the experimentally produced cases in New South Wales and those shown by the sick sheep near Charleville and Cunnamulla, and upon the botanical relationship of the plant responsible in New South Wales to the two species so common in the Charleville and Cunnamulla areas.

As the literature on the subject is not often available in country districts, the following extracts have been made from Dodd and Henry's Bulletin which is quoted above and which deals with "staggers" or "shivers" in sheep in New South Wales:—

> "Neither sex, age, nor condition appear to have any influence on its occurrence, but young animals are said to suffer most severely, even suckling lambs and foals being affected. Experimentally, it will be seen that in suckling lambs the disease made its appearance much quicker than in adults. Fat animals appear to suffer most as concerns adults, but this is probably because they are heavy feeders and have most weight to carry. . . . The occurrence of the disease in very young lambs from a few days old suggests that the causal agent may be transmitted in the mother's milk.
>
> "The disease is much more prevalent in some years than in others, being influenced by the character of the season. As a rule, it is more evident during or following a good rainfall, when there is a luxuriant growth of herbage in spring, following a mild winter. It has, however, been seen in a dry season when only dried herbage was available as fodder.
>
> . . . . . .
>
> "As a rule, no symptoms are seen so long as the animals are grazing quietly in their paddocks, but, in the case of sheep, if an affected mob is started on the road, they may travel a few hundred yards, or a few miles (according to the severity of the case), and then affected animals will begin to lag behind. These move with a rather stiff action of the hind legs, an arched back, and a stretched out head. They travel thus for a little distance, rapidly becoming worse and then stop. Respiration is rapid but shallow, and pulse quick. If urged, the affected animals will travel a few yards and again stop. Sooner or later a quivering or trembling of the muscles of the various parts, most commonly of the shoulders and hindquarters, but at times extending over the whole body, ears, and legs, will become apparent. At last the animals drop with head and legs stretched out, or with the body resting on the sternum with the forelegs doubled under. Many animals whilst down can be approached and handled without their making any effort to escape. If allowed to rest, these sheep will, after a time get up, and wander away of their own free will. If harassed by being compelled to walk, they will die. . . . Temperatures noted have varied from 104 deg. to 106 deg. Fahr. The sensory reflexes are weak and absent.
>
> . . . .
>
> "No pronounced lesions have been observed anywhere."

QUEENSLAND SHOW DATES, 1932.

Kilcoy: 30th June and 1st July.
Home Hill: 1st and 2nd July.
Townsville: 5th to 7th July.
Gatton: 6th and 7th July.
Woodford: 7th and 8th July.
Cleveland: 8th and 9th July.
Charters Towers: 13th and 14th July.
Caboolture: 14th and 15th July.
Rosewood: 15th and 16th July.
Ingham: 15th and 16th July.
Laidley: 20th and 21st July.
Nambour: 20th and 21st July.
Cairns: 19th to 21st July.
Esk: 22nd and 23rd July.
Ayr: 22nd and 23rd July.
Mount Gravatt: 23rd July.
Bowen: 27th and 28th July.
Maleny: 27th and 28th July.
Atherton: 28th to 29th July.
Pine Rivers: 30th July.
Royal National: 8th to 13th August.
Crow's Nest: 24th and 25th August.
Wynnum: 26th and 27th August.
Mary Valley, Imbil: 2nd and 3rd September.
Enoggera: 3rd September.
Pomona: 14th and 15th September.
Malanda: 14th and 15th September.
Beenleigh: 16th and 17th September.
Rocklea: 24th September.
Southport: 7th and 8th October.
Nerang: 14th October.

COTTON GROWING.

PREPARATION OF LAND.

R. W. PETERS, Cotton Experimentalist.*

THIS is the first of a new series of lecturettes on cotton growing which will be given during the 1932-33 season. It should be understood, however, that the suggestions which will be made during these lecturettes are put forth only as ideas, which each grower should test out on his own soils to see how applicable they are to his conditions. The different types of soils and the variation in climatic conditions between seasons and districts, makes it extremely unlikely that any hard and fast rules can be laid down for all growers.

It is pointed out that these variations in seasonal conditions make it most difficult to obtain each season the maximum yield that a soil can produce. Row and plant spacings, or soils which may give the best results in a wet season, may be entirely unsuitable for a dry one. It is stressed that each grower study cotton-growing on his own farm, and endeavour to ascertain which soil or soils and what methods will give suitably profitable returns over a long series of crops, rather than try each season to obtain the best yield that the soil is capable of producing. It is the variation in crop yields which has contributed largely to the unrest and distress connected with agriculture throughout the world. When this is more widely appreciated, it is believed that greater attention will be paid to eliminating the poor yields rather than trying always to obtain the highest possible yield, for the latter happy condition is never accomplished.

In a country like Queensland, where such wide variations in climatic conditions occur, not only between seasons but in the one season, it is especially necessary that every possible precaution should be taken to eliminate the poor returns. One failure may offset the gains obtained over two or three seasons, and it is better to prevent this if possible rather than depend on an extra good crop making up the loss. It is advisable, therefore, that each cotton-grower study carefully his own conditions and test out the methods used by his most successful immediate neighbours, and any suggestions made by this Department. In this connection, methods found suitable for growing cotton in other countries should be carefully experimented with on only a small scale rather than on the whole of one's crop, for it is seldom that conditions are alike in two countries. A method suitable for cotton-growing in the United States might be exactly the opposite required here, for the climatic conditions are mostly entirely different.

Select Suitable Soils.

It is strongly suggested, therefore, that before preparing land for cotton-growing, it should be ascertained what type of soil is most likely to produce good yields of sound cotton under a wide range of conditions. Generally speaking, the clay loams overlying a clay subsoil, at a depth of 18 to 24 inches, appear to offer the best possibilities in this respect. The explanation is not entirely clear, but it has been noticed over a long series of seasons of varying nature and in different districts that these types of soils apparently can be relied upon to produce profitable crops of cotton, provided good cultural methods aiming at conserving moisture are practised.

Most Suitable Soils.

The following soils may be grouped under the heading of suitable clay loams:—Forest soils, consisting of heavy clay alluvial flats of the type usually associated with a mixture of blue gum, ironbark, and bloodwood trees; heavy clay loam alluvial flats originally carrying large box trees with a scattering of blue gums; the better classes of the grey or greyish brown clay loams of the lower slopes associated with box and ironbark trees; the brown clay loams of the slopes originally carrying a good class of narrow-leaf ironbark and in some districts silver-leaf ironbark; and in scrub soils—the heavy brigalow scrub soils or the brown clay loams of the mixed softvine and brigalow scrubs. All of these soils are generally capable of producing profitable yields of cotton of good quality, provided a variety of cotton suitable for the district is grown on them.

Limitations of Other Soil Types.

There are other classes of soils which may produce excellent yields of cotton under favourable conditions, such as the deep loams and sandy loams adjacent to the creeks in most of the cotton-growing areas; the softvine scrub sandy soils of a

* In a radio talk from 4QG.

red or in some districts grey colour; the sandy loams overlying clay on the alluvial flats which are often associated with small box trees with an admixture of ironbark; and the heavy black waxy clays of the alluvial flats, or in the "plains" country. All of these types, with the exception of the heavy black waxy clays are not very drought resistant, and require rain fairly frequently in order to prevent shedding of squares and young bolls, or damage to the fibre of unopened bolls during any periods of high temperatures or heat waves. The heavy black waxy soils may give excellent yields in seasons of moderate rainfall, but owing to their requiring several days of drying weather before cultivating operations can be performed, excessive weed growth frequently adds considerable expense to the cost of production during a wet season.

Plough Before Winter Rains.

The most suitable soil for cotton-growing having been decided upon, it is suggested that the first ploughing be done in time to obtain the full benefit of any winter rains that may occur. The experiences of growers located in most of the cotton-growing districts, and experiments on the Cotton Research Station in the

PLATE 29.—FALLOWING EXPERIMENT, COTTON RESEARCH STATION.

Illustrating benefit obtained under droughty conditions of plant cotton on a long-fallowed seed bed. Plants in foreground in cotton-following-cotton plot; plants around figure in background in cotton-following-long-fallow plot. Season 1931-32.

Callide Valley, all indicate that early planting on early and well prepared seed-beds greatly increase the chances of obtaining profitable yields. In experiments at the Cotton Research Station, carried out over several seasons, gains of at least 4 per cent. more moisture in the layer of soil from 4 to 6 inches below the surface have been obtained in the early ploughed plots following some summer crop, as compared to where cotton has followed cotton. The same or even greater differences in amounts of moisture have existed in the 10 to 12 and 16 to 18-inch levels. As these differences represented an improvement of around 15 to 25 per cent. in the moisture content of the soils, the value of such practices can be appreciated.

Three factors may have contributed to these gains:—(1) the early ploughed land allowed of better penetration of any winter rainfall; (2) ploughing after the cotton crop usually could not be done until in July after most of the winter rains had occurred; and (3) where cotton followed shallow rooted crops like Giant panicum or maize, less subsoil moisture had been taken by such crops than was the case where cotton plants with their deep rooting system had been grown. In this present season on the Research Station the cotton crops on land where maize was grown last season, have come through the extreme drought better than where cotton has followed cotton of last year.

Fallowing.

It is pointed out, however, that a gain of yield is not always obtained by planting on fallowed seed-beds, especially on rich alluvial soils. The wetter the period after planting the less likely there will be any advantage, and in springs when heavy rainfall is experienced before December it is possible that excess growth may occur on long fallowed rich alluvial flats. In dry springs the advantages are clearly indicated, however, for not only are better strikes maintained, but better development of the plant occurs during the dry periods, especially if the crop has been planted early. Likewise, during dry periods and heat waves in January and February, cotton on fallowed land is less likely to shed than where cotton is following cotton on late prepared seed-beds, especially if the rainfall has been light in the spring.

Long Fallowing.

It has been suggested at different times that growing cotton on land which has been fallowed all of the previous season would increase the possibilities of obtaining good yields. It is questionable, however, if this is necessary or of economic advantage, except possibly in the driest districts and on the droughtiest soils. In the first place no return is obtained from the land for one year, and the expense of the maintenance of the fallow throughout the previous season, as well as the cost of cultivation of the cotton crop, has to be borne by the return from one season. Also, in wet seasons fallowing would be decidedly expensive, thus increasing the cost of production. Furthermore, if spring rainfall is experienced, more than ample moisture is available where the land has been ploughed in April in a season of normal rainfall, and the seed-bed made after the first rains occurring in June. There may also be danger, particularly on rich alluvial soils, of excessively increasing the nitrogen content of the surface soils by fallowing all through the previous season. This is to be avoided, for most of the alluvial soils in the main cotton-growing areas have more than ample supplies of nitrogen now, and any increase will tend to cause rank growth of plant.

Rotate the Cotton Crop.

It is suggested, therefore, that cotton-growing be combined in a crop rotation in such a way that with small acreages, cotton will be grown only on land which has grown a summer crop, and the seed-bed prepared in time to obtain the full benefit of any winter rains. Where a large acreage of cotton is to be grown it is advisable that only as much of the old cotton land be planted to cotton in the next season, as can be cleared and put into shape in time to conserve any winter rainfall. The rest of the acreage for the new crop should have been in some summer crop which matured in time to allow of ploughing before the surface moisture from the late summer rains had been lost. This not only avoids the rush of getting the whole seed-bed prepared in a short time, often when it is too dry to work up efficiently, but also allows the new crop to be sown as soon as the first planting rains occur, and on a well-prepared seed-bed containing ample moisture.

Ploughing.

The most suitable depth and the proper number of ploughings depend considerably on the soils and the crops grown previous to preparing the land for cotton. Generally speaking, one good ploughing to a depth of 6 inches followed by harrowings at appropriate times should make a suitable seed-bed for growing cotton on most soils. New grass country, old trashy crop land, and very heavy clay soils may require different treatment. Local experience will prove the best guide in this respect. It is pointed out, however, that each season considerable acreages of cotton are lost on land that has been cross-ploughed so late that a firm compact seed-bed could not be obtained with only light planting rains. Good strikes were obtained, but the tap roots of the young seedlings soon reached dry soil overlying the subsoil and died during stress periods in November.

The following practice has been found at the Research Station to give good results where cotton is to follow cotton. Cut off and burn the old bushes as early as possible, sacrificing some of the late top crop if necessary in order to plough during early July, and thus obtain some benefit of the usual June rains. Plough 5 to 6 inches deep, and within a fortnight cross disc with a disc harrow to break down and firm the seed-bed. Harrow with spike-tooth harrow if good August rains occur, otherwise wait until the planting rains, when a good cross harrowing is given

prior to planting. This method may not suit very heavy clay loams, but it is strongly suggested that wherever suitable the soils below the surface be compacted after the first ploughing rather than loosened up by further ploughings. Conservation of seed-bed and subsoil moisture is the most acute problem connected with cotton-growing in most of Queensland, and when more attention is paid to this factor undoubtedly much better strikes will be obtained and stands maintained under adverse conditions.

SUMMARY.

Summarising the points which have just been made, it is believed that cotton can be grown profitably over a wide range of districts and climatic conditions in this State. Particular attention should be paid to selecting the most suitable soils for each range of conditions and variety of cotton. Plant only on well-prepared seed-beds either wholly in rotation with summer crops in the case of small acreages, or partly so with growers planting large areas. Endeavour to obtain firm compact seed-beds as early as possible, for the general experience has been that cotton seedlings stand up to stress conditions on these better than on late prepared, open, loose ones. Plant as much cotton as can be taken care of properly. Greater yields will be obtained with a lessened cost of production. Grow cotton, for the Australian demand is increasing yearly.

AUSTRALIAN BIRDS—IMPORTANCE TO AGRICULTURE.

In an illustrated lecture on Australian Bird Life given recently by Mr. T. W. Hamilton, secretary of the Gould League of Bird-lovers, to members of the Sydney University Agricultural Society, the necessity for appraising the economic value of the various species of birds was strongly emphasised. The lecturer, in stressing the interest taken by farmers and their families in bird life, referred to numerous sanctuaries established by them in the protective confines of their homesteads simply by providing a source of water for the bird visitors.

The adaptation of birds to different environments had resulted in a great diversity of birds, said Mr. Hamilton. They might, however, be classified into three great groups—water birds, birds of the air, and land birds. The water birds, characterised by boat-shaped bodies, greasy feathers, and webbed feet, and embracing swimmers, waders, and divers, included many valuable economic species. Thus the huge deposits of phosphate rock on Ocean and Nauru Islands, so important as a source of material for the manufacture of superphosphate were formed from the guano deposits laid down by birds in this group. Huge flocks of gannets on Cat Island, in the Bass Strait, and penguins on the Five Islands, of Wollongong, were responsible for similar phosphatic debris, which might ultimately be of economic importance. Other important members of this group were the ducks, destroying quantities of rice on the irrigation area, and the ibis, which consumed large numbers of grasshoppers.

The second group, the birds of the air, which had long wings and streamlined bodies, included such insectivorous birds as the swift and swallow, whose work in battalions probably had a cumulative effect in keeping down such insect pests as the fly and mosquito. Hawks also belonged here, and, although they were reputed to worry the flocks, helped to keep rabbits and rodents in check.

The land birds, which formed the third group, included runners—birds with long legs and necks—and flying and perching birds having well-developed wings and legs. Amongst the runners, the emu, always a picturesque Australian feature, received variable treatment from squatters. Thus, whilst many protected them, others, because they were supposed to spread the prickly-pear, foul pastures, destroy fences, and to frighten ewes at lambing time, broke their eggs and did all they could to harry them.

The flying and perching birds, including such important representatives as the magpie, peewee, wagtail, and wren, were perhaps our most important insectivorous friends, the lecturer added. In addition, the peewee, by devouring snails in swamp areas, helped to keep down the fluke trouble, and the honeyeaters, by carrying pollen on their beaks, helped in the fertilization of flowers—the waratah, for example. Parrots, however, were a mixed blessing, for, in spite of their value in destroying weed seeds, the rosella often did much damage in the orchard, and the white cockatoo at times made inroads into maize and wheat crops.

THE CULTIVATION OF GRASSES.

CAREFUL SELECTION OF SEED.

By F. F. COLEMAN, Officer in Charge of Seeds, Fertilizers, and Stock Foods Investigation Branch.

A VERY interesting address on the cultivation of highly nutritive grasses and the careful selection of grass seed was delivered by Mr. F. F. Coleman, Secretary of the Pasture Improvement Committee, and an officer of the Department of Agriculture in the Widgee Shire Hall on 24th May, under the auspices of the Gympie Ward of the Queensland Local Producers' Association.

Mr. Coleman said that there was no need for a Queensland farmer to buy foreign grown seed, as most of his requirements could be supplied from seed grown in Queensland or the Southern States, or obtained from New Zealand, England, and Canada. It was frequently overlooked that even such seeds as mangel, swede, and turnips were grown extensively in England where seed-growing was an important industry, occupying many thousands of acres and employing a large amount of skilled agricultural labour, the actual seed grower or farmer having a specialised knowledge of the straggling or rogueing of crops.

Queensland Grown Seed.

Leaving out the cereals, the principal seeds grown in Queensland were Sorghums, *Sorghum sudanense* (Sudan grass), *Setaria italica* (Foxtail millet), Japanese millet, white panicum, and sometimes a small acreage of the so-called white French millet (*Panicum miliaceum*). The Foxtail millets include all forms of Setaria, in Queensland miscalled panicum, and many farmers complained every year that the crops did not turn up to their expectations. In this particular direction, a start could at once be made with the growing of certified seed. It was impossible to distinguish the seed of the dwarf growing variety from the tall grower, and it would not be advisable to attempt a field selection of any of the strains at present on the market. A small quantity of seed had, however, been saved from plants that might well be described as light in colour, tall in growth, and late seeders, the varieties that lead to disappointment were usually a bit darker in the leaf, formed their seedheads very early, and under dry conditions rushed into seed when they were about a foot high. Assuming farmers were honest with themselves, it was obvious that no one would attempt the growing of the dwarf early.

The Merchant and Grower.

As far as the seed merchant was concerned, he was absolutely at the mercy of the seed grower, who might submit a wonderful sheaf of plants showing all the characteristics of the tall late, yet when the seed had been threshed, it would be found on careful examination that the resulting crop contained a large percentage of dwarf early. On careful examination under a good lens, it was possible to tell in the early stages of growth as to which category the plant belongs. Assuming a man had 10 acres of this crop, it was obvious that the millions of plants could not be examined individually. The position was, therefore, that given a small quantity of seed saved from isolated plants, and thoroughly examined by a competent officer of the Department of Agriculture, it would, if the idea takes on, be possible to sow a small area with such stock seed and produce seed in commercial quantities. During growth the area would have to be carefully examined to ascertain if by any chance it contained any undesirable characteristics. Assuming such seed was threshed at a place free from all impurities and other strains of millet, it should be possible to put the resulting crop up into bags, sealing them with an appropriate mark, and forward the resulting crop to a seed merchant equipped with efficient seed cleaning machinery, which was necessary to take out the weed seeds that are more or less present in all crops. The seed merchant would then be in a position to offer for sale certified tall late Setaria seed. A stumbling block was that farmers persisted in calling setaria, panicum, or giant panicum. Actually, giant panicum, if the words meant anything, indicated the material offered for sale consisted of seeds of Panicum maximum, which was Guinea grass.

Crops Suitable for Queensland Conditions.

A somewhat similar procedure was required for other plants. However, the fact must not be overlooked that the crops essentially suitable for present conditions of Queensland agriculture, would include *Setaria italica* (Foxtail millet), white panicum, Japanese millet, white French millet, Sudan grass, all varieties of saccharine sorghum, cowpeas, and last, but not least, lucerne. In the case of lucerne,

it must not be overlooked that many paddocks within our State were dodder-infested, and also contained weeds that it is difficult to separate from the crop required. This, therefore, comes back again to better farming, and the sowing of assured strains on land that had been properly prepared, and was free from a profusion of weed seeds in the soil. Seed certification did not mean to rush about, looking at small paddocks of unknown parentage, but a careful examination of paddocks suitable for seed purposes on notification from the actual grower that it was his intention to save for seed a definite area. At present, many tons of lucerne seed were grown in the Southern States and sold to Queensland merchants. This might well be grown in our own State if more care were exercised in the field.

Queensland was a large producer of Rhodes grass seed. Unfortunately, many samples contained seeds of other varieties of Chloris, also the seeds of worthless plants. Greater care should, therefore, be adopted in the growing of Rhodes grass seed. Merchants to their cost, knew only too well the trouble that some of them had experienced in the purchase of small lots, every bag of which differed from the next, and on inquiry it had been sometimes found that the seed represented material collected from several farmers during a period of probably over one year, and represented seed produced on paddocks varying in character and weed growth.

There are several large Rhodes grass seed growers who usually find a ready market for their crop in the Southern States.

Paspalum dilatatum.

Unfortunately, there were several varieties of paspalum. Paspalum dilatatum was the one of the most importance for grazing purposes. Many samples of both Queensland and New South Wales Paspalum dilatatum seed represented crops harvested before they had fully ripened. To get seed—of high germination—it was essential that hand-shaken seed be the only seed collected. It was no infrequent occurrence for a merchant to submit a sample representing twenty bags of paspalum that he had purchased and find that the bulk did not come up to the grower's sample which had been hand-shaken and probably carefully selected, with the result that such small sample represented seed of high germination, while the bulk seed was of poor quality. Again, it was necessary for growers to exercise far greater care than had hitherto been the case. They should also remember that very large quantities of Paspalum dilatatum seed were produced in the Northern Rivers of New South Wales. Apart from the fact that every dairyman who grows paspalum seed was losing a tremendous weight of green feed that should have been grazed in the early stages of growth, it was questionable if many ever made a deliberate attempt to grow paspalum for seed purposes. In many instances, the seed lacked quality owing to the land's deficiency in phosphates. Although phosphates did not directly make grass grow, their absence was against the plant forming grain. The formation of fully-grown caryopses was the first essential for heavy seed of good growth, as it was quite possible to get a tremendous bulk, over 90 per cent. of which would be useless.

Requirements of Seed Production.

In seed growing, one had to look for places suitable for the plant's whole life-cycle. It therefore followed that Rhodes grass, which would put up with drier conditions than exist on the coastal belt, produceed good seed in the Gayndah and some other inland districts. Paspalum on the other hand, a grass that requires more moisture, did well within the coastal belt. Both of these were summer plants. When they came to other grasses, such as oats, which is a grass, it should always be kept in mind that winter-growing plants required cooler conditions to produce the best of the seed crop, therefore, oats for seed purposes, if grown in, say, the Yangan district, would have a quite different appearance than those grown further North. This again brought them to the fact that Prairie grass, a winter-growing plant, did well under the cooler conditions of the Darling Downs, and it should be quite possible to grow for seed purposes Australia's supply of Prairie grass on the Yangan-Killarney Line. Care, of course, would have to be taken to ensure a thorough preparation of the land, and the getting rid of all bad weeds, such as Hexham Scent (*Melilotus parviflora*), which it should be remembered, was a yellow flowered sweet clover. The white flowered sweet clover would have the same obnoxious characteristics if permitted to get into the wheat or other grain. Districts that were suitable for the growing of Prairie grass seed, and were capable of growing good heavy oats, would lend themselves to a start in the direction of producing true Perennial Rye grass, also Perennial Canary grass (*Phalaris tuberosa*).

There was, however, a catch in the growing of such crops. When the buyer was obsessed with the idea of price, he would in the end be taken down, as the ready

seeding forms of Rye grass are not perennial. It was possible by the aid of a quartz lamp to examine the germinating seeds of Rye grass, and find the absence or presence of fluorescence. This was again work for the specialist. With *Phalaris tuberosa*, it could not be too strongly stated that there existed a considerable quantity of Canary seed that probably would give better results during the first year, and then die out. It was obvious that the first essential for any grower who intended producing *Phalaris tuberosa* was to clean up the whole farm and get rid of all other forms of Phalaris. It would not be safe to grow *Phalaris tuberosa* on land that had carried the canary seed of commerce which means the one used as bird seed. A true strain of *Phalaris tuberosa* would probably not produce any seed during the first year. It therefore followed that anyone who attempted the growing of such plants would have to look forward to practically three years' work before he would have any returns for his outlay. During this period the paddock should be carefully inspected by a competent officer, and only saved for seed when the existing crop met with the officer's full approval. Care must always be exercised in the growing of new crops, as it would be possible for several large growers to produce a quantity of seed and flood the market, the demand being at present small, the price high, and practically no demand outside of Australia.

Those who were interested in the growing of such crops might well make a small attempt, but should never rush into seed growing unless they were fully aware of the care required, and the time that must elapse before they could turn their crop into money. Perennial plants, such as *Phalaris tuberosa* and true perennial rye grass, were crops that would stand grazing for many years. It therefore followed that until the pasture had been properly established, seed could not be produced in the easy manner that was possible with annual plants, such as prairie, oats, or millets.

Further Experiments Necessary.

Mr. Coleman went on to stress the necessity for further experimental work with many varieties of grasses. At present they could not go very far, and it was only through the backing of the farmers themselves that they could hope to obtain the facilities necessary to unearth the large amount of valuable information yet unknown with regard to grasses. It was the varying conditions in Queensland and their effect on grasses and seeds that required careful investigation; these conditions were vastly different to those in the Southern States. Long plodding work was necessary, and with the help of the farmer his Department would do its utmost to improve pastures throughout the State.

Use of Fertilizers.

Mr. Coleman referred at length to fertilizers, outlining the respective effects of nitrogen, superphosphate, potash, lime. Where land did not contain sufficient phosphates it usually lacked the conditions suitable for good root growth, and the use of superphosphate and sulphate of ammonia was necessary to remedy this defect, while the nitrogen contained in this fertilizer mixture gave a leafy growth which was so necessary for good feeding qualities. With superphosphate giving an improved root growth, and nitrogen improving the leaf, the combination of the two greatly enhanced the feeding qualities of grasses treated in this manner. Lime was described to him by an American as "making the soil friendly to the plant," and this truly was what it did. Potash was not always required, but its effect is linked up closely with nitrogenous fertilizers, which increase the size of the leaf; potash corrects the possible ill-effects of an excess of nitrogen, and is of particular value in lands that will not readily produce clovers or lucerne.

There was still much information to be obtained with regard to clover, remarked the speaker. Clover would not take root in hard soil. Renovation was necessary first. It was astounding the effect superphosphate had on some varieties of clover. Where the clover had already grown and died out, new growth could be established more easily than on new ground.

In answer to a question, Mr. Coleman stated that so far as the Gympie district was concerned, there was not as yet any definite information regarding the Montgomeryshire late-flowering red clover; it would be quite a year or more before it would be possible to form an opinion.

In the course of the following discussion, Mr. T. Steele outlined the experimental work which he was carrying out on his farm. He had four paddocks and was treating each of them with a different mixture of fertilizer. Good results had been obtained up to the time the caterpillars had ravaged the paddocks, but since the recent rains the growth was responding well, and given a good season some important results would be obtained.

THE NUT INDUSTRY IN QUEENSLAND.

ITS POSSIBILITIES.

By H. BARNES, Instructor in Fruit Culture.*

MANY people are just beginning to realise the possibility of deriving a reasonable return from nut growing. Up to the present, it might be said, the nut industry in Queensland is undeveloped; judging, however, from the many inquiries which are being made by prospective growers, it may not be long before nut growing has a definite place in our rural economy.

THE QUEENSLAND NUT.

The Queensland nut has been stated by experts in various parts of the world to be one of the finest nuts grown, and we are fortunate, in this respect, that it is indigenous to our coastal districts. This is its native home, and, of course, it naturally follows, that it will grow better, and produce bigger and finer crops here than in other countries to which attempts have been made to introduce it.

That the value of the nut is realised in foreign countries is evident from the number of requests which have been made for seed, and the demands for large quantities for commercial purposes, up to 10 tons, which have been made. At present the supply is not nearly sufficient to meet our own requirements, let alone supply those of other countries.

Where It Thrives Best.

Since it is indigenous to the coastal scrub lands the Queensland nut thrives best in conditions as closely approaching those of its natural habitat as possible. Banana plantations are usually planted on good scrub lands, and many of these would make excellent sites for the growing of nuts. The trees would not appreciably affect the growth of the bananas, and the farmer would have the advantage that, if the nuts were planted at the same time as the bananas, when the bananas were finished the nut trees would be coming into bearing, so that the ground would not lie idle. Banana plantations also are usually protected from heavy winds by sheltering woods, and this is of considerable importance to the nut trees. Wild nut trees seen growing in open country invariably carry a heavier crop on the sheltered side away from the prevailing winds than on the more exposed side, proving that the provision of shelter is advisable.

Planting Points.

When planting an orchard with Queensland nuts they should be set approximately 24 ft. apart, allowing plenty of room for expansion. This distance will allow of seventy-five trees being planted to the acre. The trees will commence to bear in five or six years and will gradually increase in production each year, attaining the maximum yield in twelve to fifteen years. Opinions vary amongst growers as to the yield that may be expected from trees in full bearing, but it appears that round about 80 lb. per tree per annum may be regarded as an average. Mr. H. J. Rumsey, of Dundas, New South Wales, who is the author of a book on nut growing, mentions an average return of 20 to 30 lb. per tree, or about 1 ton of nuts to the acre. He admits, however, that his figures are based on low returns from poor trees growing in a district with only a small rainfall, or, in other words, in an unsuitable district. He adds that, with watering, he would expect to at least double this yield. On Queensland scrub lands, however, where there is ample rainfall and more natural conditions for growth, there is no necessity for watering, and better returns than those expected by Mr. Rumsey may be looked for. The present market price for the nuts is 8d. to 1s. per lb., and the small quantities offering are eagerly sought after by merchants, confectioners, &c., who find many uses for them. Once the Queensland nut tree has become established it requires very little attention; on account of its hardiness it will stand up well under adverse conditions, and no disease so far has been known to attack it.

Improved Varieties.

There are several distinct varieties of the Queensland nut which vary in size and in the thickness of the shell. The actual value of the crop is gauged according to the proportion of the weight of the kernel to that of the shell. The Queensland

* In a Radio Address from 4QG.

nuts growing under natural conditions in our scrubs mostly possess comparatively hard, thick shells, requiring the exercise of considerable pressure to crack them. In recent years, however, attention has been directed towards the propagation of the better strains of which a limited number of bearing trees are located in the Southern districts and in New South Wales. They have not been classified into varieties but are sold under local names, such as "Thin Shell," "Everbearing," "Medium Shell," "Narrow Leaf," &c.

(CAUTION COUNSELLED.—In making a statement on the production of Queensland nuts recently, the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) was speaking from personal experience, as he has made several experiments in growing the nuts at his farm near Cleveland. Mr. Bulcock said that prospective growers of Queensland nuts should go carefully into the matter before embarking on their production. It had been said that nut growers might secure extraordinarily high returns from an acre, but there was no data on hand to support that assertion, and it would be unwise of people to rush into their production in that hope. There was nothing to guide prospective growers on such important matters as fertilizers, while it had to be remembered that trees did not come into bearing for five years, and that only certain types of soil would produce Quensleand nuts. The Minister added that he intended to acquire a small area of land in Brisbane, and would detail an officer of his Department to make tests in order to see what there was in the industry under judicious management.—Ed.)

THE PECAN NUT.

Regarding the pecan nut, this is closely allied to the walnut; in fact, it belongs to the same natural family. It is indigenous to and grows wild in various parts of the United States and the Gulf of Mexico, but up to the present has not been cultivated to any extent as an ordinary orchard tree in Queensland; however, its possibilities are well worth considering. It is one of the most important nuts grown in America, and is excellent both in quality and in delicacy.

The few trees that are in this State are grown over a wide range of localities; some are growing in the North, some in the South, and some at Toowoomba. The tree is also grown in various parts of South Africa where it is looked upon as highly profitable. The propagation of the pecan nut from seed is not difficult, and further information on this aspect may be obtained from the Department of Agriculture. The trees thrive best in deep fertile loams and on river flats, but although it favours this type of country it has what may be termed an obliging nature and adapts itself to a fairly wide range of soils. Here again our banana farmers could quite profitably use their banana land. Although the tree is partial to fairly moist conditions the subsoil requires to be well drained, as the main roots have the reputation of seeking water at a great depth.

The planting of seedlings should be avoided as far as possible because, as is the case with most other trees, the product of seedlings is variable no matter how carefully they are selected; so the working over of proved varieites is resorted to. Some difficulty was at first experienced in obtaining good results with grafting, but this difficulty has now been practically overcome.

Pecan nut trees grow to an enormous size when planted under favourable conditions. Specimens in existence in America are 9 feet in diameter and up to 170 feet high. Although a few nuts are borne after four to five years, anything like a crop cannot be expected until the tree reaches an age of eight to twelve years when the yield may total 3 bushels of nuts, increasing as the tree gets older up to perhaps 20 bushels. The pecan tree is very long-lived, and in a good deep fertile soil will grow and bear for 100 years or more.

Food Value of Nuts.

Before concluding, I would like to mention a few facts regarding the value of the nut as an article of food. Many people, perhaps, do not fully realise just what a highly concentrated and valuable food the nut really is. Dr. Morris, an eminent authority on the value of nuts generally, is very emphatic on the subject of nuts as a standard food. He has written a book on the subject, and in one portion he states: "Nuts furnish proteins of such fine quality that they supply the elements necessary to render more complete the proteins of cereals and other vegetable foods." From these few words we deduce that nuts are not, as we may, perhaps, have been inclined to look upon them, a delicacy to be indulged in at Christmas time and on other festive occasions, but are really a necessary article of our daily food; so that, to the many slogans: "Use more wool" and "Eat more fruit," &c., we might very well and with advantage add another, "Eat more nuts."

CITRUS FERTILIZER TRIALS.

R. L. PREST, Instructor in Fruit Culture.

FOLLOWING is a report of recent fertilizer trials carried out by the Fruit Branch:—

No. 1 plot—Mapleton Farm College.

No. 2 plot—R. A. Ulcoq's Orchard, Gayndah.

No. 3 plot—V. G. Pack's Orchard, Montville.

Fertilizer.		Before Trials.		During Trials.		
		1927.	1928.	1929.	1930.*	1931.
		Cases.	Cases.	Cases.	Cases.	Cases.
No. 1—						
Sulphate Ammonia	.. 12 lb.	$1\frac{1}{2}$	2	2	8	10
Nauru Phosphates	.. 14 lb.					
Sulphate Potash ..	.. 4 lb.					
No. 1A—						
Sulphate Ammonia	.. 15 lb.	$1\frac{1}{2}$	2	2	7	8
No. 2—						
Sulphate Ammonia	.. 4 lb.	$1\frac{1}{2}$	2	3	8	7
Dried Blood ..	.. 4 lb.					
Nauru Phosphates	.. 8 lb.					
Sulphate Potash ..	.. 3 lb.					
No. 2A—						
Dried Blood ..	.. 16 lb.	$1\frac{1}{2}$	2	$2\frac{1}{2}$	6	5
No. 3—						
Sulphate Ammonia	.. 6 lb.	2	4	3	7	7
Nauru Phosphates	.. 9 lb.					
Sulphate Potash ..	.. 3 lb.					

Plot.	Cost of Fertilizer, 1930-31.	Average Net Returns, 1931.
No. 1 ..	3s. 6d. per tree	5s. 0d. per case; 45s. 0d. per tree
No. 2 ..	3s. 0d. per tree	7s. 6d. per case; 45s. 0d. per tree
No. 3 ..	3s. 0d. per tree	5s. 6d. per case; 38s. 6d. per tree

Plot No. 1.—Mapleton Farm College: Variety, Valencia Lates.

The trees on this plot are in a healthy condition, foliage and fruiting-wood good. An excellent crop set, during the hot, dry period experienced in December-January. The fruit received a check, but filled out well on maturing. It was well distributed over the trees and of even size, good quality, and markedly free from disease. The fertilizer of section 2 of this plot has been altered to the complete mixture.

Plot No. 2.—R. A. Ulcoq's Orchard, Gayndah: Variety, Beauty of Glen Retreat

On this plot all trees with the exception of three are in a healthy condition, foliage and fruiting-wood good. Investigation disclosed that Armillaria mellea was the cause of the three trees sickening. They are making a satisfactory recovery after treatment. The crop set well, but was rather on the large size for the dry period during December-January, the irrigation plant at present installed being inadequate. Until this is remedied, care must be exercised in regulating the crop. The fruit was well distributed over the trees and of good size and qaulity. On section 2 the fertilizer was altered to the complete dressing.

Plot No. 3.—V. G. Pack's Orchard, Montville: Variety, Sabinas.

As in the case of the other plots, trees are in a healthy condition, foliage and fruiting-wood good. The crop set evenly, and proved to be of good size and free from disease. Here a section of eight Scarlet trees have been included for pruning and fertilizer observation.

Comments.

The practical management of the soil whereby profitable crops may be grown without materially reducing the fertility of the land rests on five fundamental principles, viz.:—(1) Drainage; (2) tillage; (3) organic matter; (4) lime; and (5) fertilizers. Obviously the removal of excess water depends on adequate drainage, while aeration and all the activities that attend it rests both on drainage and tillage. The upkeep of the soil organic matter by the use of farmyard manure, and by turning under green crops, has been emphasised in earlier notes as fundamental to continuous productivity. Finally, the judicious use of commercial fertilizers must receive careful attention.

The striking increase in yields for 1930-31 crops over the previous yields shows clearly that badly run-down orchards can be brought back to good bearing only after several years of good care. Nitrogen appears to be one of the most important elements required. Fertilizers containing nitrogen, phosphoric acid, and potash show very satisfactory results, and with slight variation to suit local conditions mixtures used will serve as a guide for fertilizing programmes.

POULTRY RAISING EXPERIMENTS.*

By P. RUMBALL, Poultry Expert.

The Honorary Poultry Advisory Committee, in deciding on a scheme of experiments to be carried out under its auspices, found it desirable to inquire into the methods at present adopted in feeding growing stock. A comparison of methods commonly employed in this State with those in operation and recommended elsewhere suggested that local farmers fed too little protein in the early stages of growth.

A feed test, begun on 2nd October, 1931, *and discontinued in March,* 1932, *fully confirmed these conjectures. In addition, valuable information was obtained relative to the cost of rearing of both cockerels and hens. Now that the rearing of cockerels for market, either local or overseas, is becoming of greater importance, and because of the increasing number of immature cockerels placed on the markets, the information given in this article should assist materially in deciding on the economics of cockerel rearing, and make for the rapid production of well-grown birds.*—ED.

STOCK USED.

IT was decided, in order to work with birds that had had no set back, to rear chickens from the time of leaving the incubator. Two hundred White Leghorns and 100 Australorps day-old chickens were secured. In the rearing of these birds a considerable quantity of data has been collected, which has a bearing not only upon the rearing of cockerels but also upon the more important (to the farmer) sex—pullets.

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* Published by the direction of the Minister for Agriculture and Stock and under the auspices and approval of the Honorary Poultry Advisory Committee.

SYSTEMS OF FEEDING.

The all-mash system of feeding was adopted as it was considered that this was the best method of controlling the kind and consumption of food of individual birds. Feeding was commenced thirty-six hours after hatching. The mash was placed in shallow trays about 1 inch in depth during the first few days. The trays were then increased to a depth of 2 inches, and later troughs about 4 inches wide were used. A piece of netting was placed on the top of the mash in the trough so that it would sink as consumption took place. This prevented the birds from scratching the mash out of the troughs.

During the first week, 8 feet of feeding space was allowed for every 100 chickens. This was later increased to 12 feet for every 100 birds. At the time when shallow trays were being used, the mash was not covered with netting, and, consequently only a little at frequent intervals could be added to the containers, which were never allowed to become empty.

RATIONS.

Before preparing the ration, information was gathered from individual producers on their method of feeding. In the majority of cases it was considered that insufficient protein was supplied. With the object of demonstrating the advisibility or otherwise of feeding an additonal amount of protein, two rations almost identical with respect to grain but containing different amounts of protein concentrates were fed. Liberal use was made of milk by-products for the first eight weeks. Later, protein of vegetable origin replaced the usually more expensive animal proteins. These rations will be referred to as a high protein ration and a low protein ration.

[RATIONS (Figures all in pounds).]

—	8 Weeks.		8 Weeks—Maturity.	
	High Protein Ration.	Low Protein Ration.	High Protein Ration.	Low Protein Ration.
	Lb	Lb.	Lb.	Lb.
Maize meal	40	49	56	60
Bran	20	20	10	12½
Pollard	20	20	10	15
Meat and bone meal	7½	3¾	5	3½
Dried buttermilk	10½	5¼	5	..
Salt	1	1	1	1
Codliver oil	1	1	1	1
Peanut meal	..	..	10	5
Bonemeal	..	..	2	2
Crude protein content	17·15	15·01	18·07	14·57
Cost per 100 lb.	8s. 3d.	7s. 3d.	8s. 11d.	8s.

NOTE.—In both cases it will be noticed that high protein rations are more costly than the low protein ration, and that the cost of the rations used from eight weeks to maturity was higher than during the earlier growing period. This is due to the increase in value of fodder during the latter period, and not to the nature of the ingredients used.

It was originally intended to reduce the amount of protein when the birds had reached the age of fourteen weeks. This, however, was not done as no previous record was available of a feeding test conducted under Queensland conditions.

REARING.

The cold brooder system was adopted. This was used in an iron shed 6 feet deep and 8 feet long. For protection against the south-easterly weather, half of the front was covered with corrugated iron. The cold brooder was set up on a wooden floor upon which a bag was spread. After the chickens were placed under this brooder the curtain was dropped and kept down for twenty-four hours. It was then permanently raised and the chickens allowed to wander in and out of the

brooder at will. Their range, however, was restricted by a circular barrier of 1-inch wire netting, which, for the first day, was touching the four corners of the brooder. The range was extended by lengthening the netting from day to day, until at the end of seven days they had the entire liberty of the house. On the eighth day they were given the liberty of a 23 feet by 8 feet netting run, and kept under these conditions until four weeks of age. The number of the chickens in each pen was then halved. This reduced the number in a shed to 50, and they were kept under these conditions for another four weeks. The birds were then classified as to sex, separated and submitted to various conditions.

WEIGHING OF BIRDS AND FEED.

The chickens used in each batch were weighed on being placed under the brooder, and at the end of each week the birds in every test were weighed collectively. The food consumed was weighed and recorded before being placed in the receptacle in each pen. At the end of each week the balance unconsumed was recorded.

SECTION 1.

WHITE LEGHORN CHICKENS.

The following table gives in ounces the average food consumed and weight of chickens at weekly intervals:—

TABLE 1.

Age.	High Protein.		Low Protein.	
	Weight of Chickens.	Food Consumed.	Weight of Chickens.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·32	..
1 week	1·97	1·64	1·87	1·36
2 weeks	3·31	3·36	2·81	2·95
3 weeks	5·31	4·80	4·07	3·61
4 weeks	7·61	6·46	5·72	4·68
5 weeks	9·94	7·58	7·58	5·70
6 weeks	12·92	8·96	9·83	7·32
7 weeks	16·65	8·65	12·21	9·43
8 weeks	20·41	13·29	15·56	11·34
Total food consumption	..	54·74	..	46·39
Total cost per chicken	..	3·4d.	..	2·5d.
Reared—				
Cockerels		47		44
Pullets		44		51

The foregoing table gives striking evidence of the desirability of increasing the protein content of the ration. It increases the cost of rearing each chicken, but at eight weeks chickens reared on the high protein ration were stronger, more vigorous, and in every way more desirable.

SECTION 2.

WHITE LEGHORN COCKERELS.

When the chickens had reached the age of eight weeks the cockerels were separated from the females and handled with the object of ascertaining whether the development that would take place at any period would justify their retention by producers.

Half of the cockerels reared under each ration were placed in pens and half in batteries. Each lot was collectively weighed and the advantage in weight in each case given to the battery-treated birds. However, owing to the use of unsuitable wire for the flooring of the battery, that part of the test had to be discontinued. These birds were reared up to the eighteenth week.

The following table gives the average weight in ounces of cockerels, and food consumption at fortnightly intervals. The weight of food consumed at eight weeks as shown in the table is the average for all chickens:—

TABLE 2.

Number of Birds.	High Protein Ration 23.		Low Protein Ration 22.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
When placed in pen—	Oz.	Oz.	Oz.	Oz.
8 weeks	21·4	54·74	16·3	46·39
10 weeks	28·8	29·80	20·9	24·60
12 weeks	34·7	32·38	27·2	29·13
14 weeks	42·3	31·83	32·9	30·47
16 weeks	47·8	31·27	37·4	29·60
18 weeks	51·1	35·84	43·6	37·48
Total cost of food consumed in pence		14·19	..	11·57
Total weight of food consumed in ounces		215·86	..	197·67

In this section of the experiment it will be noticed that up to ten weeks a greater development was obtained by the feeding of a high protein ration; that after ten weeks the rate of development is about the same as on the low protein ration. Further work is required to confirm this point.

DEVELOPMENT OF SEX.

The early detection of sex, made possibly by the pronounced comb development of birds fed upon the high protein ration, will assist farmers who at present, in no circumstances, will consider the raising of White Leghorn cockerels until they are in the best state to market. It would have been possible, with little or no margin of error, to cull out the cockerels before they were two weeks of age in these pens. This, however, was not possible with the chickens fed upon the low protein ration.

SECTION 3.

WHITE LEGHORN PULLETS.

The following table gives the average weight in ounces of pullets and the food consumption at fortnightly intervals. The weight of the bird shown at eight weeks is the average weight at that period, and that of the food, the average consumption for chickens for both sexes:—

TABLE 3.

Number of Birds.	High Protein Ration 44.		Low Protein Ration 51.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
	Oz.	Oz.	Oz.	Oz.
8 weeks	18·8	54·74	14·7	46·39
10 weeks	23·7	23·50	18·9	21·70
12 weeks	29·6	25·63	23·8	23·84
14 weeks	35·3	26·63	29·5	26·81
16 weeks	36·1	28·54	33·6	27·12
18 weeks	42·0	27·17	36·4	26·24
20 weeks	45·9	29·07	40·0	29·28
Total weight of food consumed in ounces		215·28	..	201·38
Total cost of food consumed in pence		14·15	..	11·8

It will be noted that in this test the pullets receiving the high protein ration continued to show an increased rate of development until the twelfth week, and that from then until the twentieth week the gain was 16.3 oz. on the high protein ration, and 16.2 oz. on the low protein ration. It appears, therefore, that little

advantage was gained by the feeding of a high protein ration after the age of twelve weeks (compare Section 2).

Practical farmers who visited the station were impressed with the development of the White Leghorn pullets reared upon the high protein ration. One farmer stated that while the low protein ration pullets compared favourably with October hatched chickens upon the commercial farms, the high protein ration chickens showed the stamina and development of August and September hatchings.

SECTION 4.

AUSTRALORP CHICKENS.

In this section the Australorps were reared to the age of eight weeks upon the high protein ration. The following table gives the average weekly weight in ounces of the chickens and the food consumption:—

TABLE 4.

Period.	Chick Weights.	Food Consumption.
	Oz.	Oz.
Day old	1·36	..
1 week	2·14	1·53
2 weeks	3·61	3·32
3 weeks	5·84	5·05
4 weeks	8·68	7·20
5 weeks	12·08	6·89
6 weeks	15·86	10·62
7 weeks	20·17	13·95
8 weeks	25·31	15·05
Total consumption of food in ounces	..	63·61
Total cost of food consumed in pence	..	3·94

Birds reared—
Cockerels 38
Pullets 55

The most outstanding feature was the satisfactory development made. The cockerels were then divided into two lots, one lot being placed in batteries and the other lot reared in pens. The battery test was abandoned (*see* Section 2).

SECTION 5.

AUSTRALORP COCKERELS.

The following table gives the weight in ounces of the Australorp cockerels, food consumption, and gain per fortnightly period. The food consumption shown at eight weeks is the average for both sexes:—

TABLE 5.

FEEDING—HIGH PROTEIN RATIONS.

Number of Birds, 19.

Period.	Weight of Bird.	Food Consumption.	Gain per Period.
	Oz.	Oz.	Oz.
8 weeks	27·5	63·61	..
10 weeks	38·5	35·90	11·0
12 weeks	49·1	40·88	10·6
14 weeks	60·3	40·22	11·2
16 weeks	72·4	45·88	12·1
18 weeks	85·0	51·39	12·6
20 weeks	93·7	55·75	18·7
22 weeks	103·5	50·41	9·8
24 weeks	108·2	47·16	4·7

From the figures above, a very uniform rate of development is indicated up to the eighteenth week. At that period the rate of development began to decrease rapidly. This was due to the fact that the birds were approaching maturity.

The feeding costs per bird from the tenth week until the eighteenth week varied from 2.4 pence to 3.4 pence per fortnightly period. Twelve ounces increase in body weight were produced for this cost. A similar expenditure on food for the later periods secured only four to nine ounces. From the point of view of costs, producers should consider the disposal of males of this variety at or about the age of eighteen weeks. From then onwards the birds commence to make rapid sexual development, and, consequently, do not materially increase in weight. Birds that are sexually mature do not command the same market value as those that are not. This still further emphasises the necessity of disposal before that stage is reached. The average weight at this period is in the vicinity of 5 lb. This is a handy sized bird to market and finds a ready demand.

SECTION 6.

AUSTRALORP PULLETS.

These pullets were reared to the age of eight weeks upon a high protein ration. They were then divided into two lots, one lot being placed upon the high protein ration, and the other upon the low protein ration, as indicated for birds reared from eight weeks to maturity. The following table gives the average weight in ounces of pullets and the fortnightly food consumption:—

TABLE 6.

Number of Birds.	High Protein Ration 23.		Low Protein Ration 22.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
	Oz.	Oz.	Oz.	Oz.
8 weeks	24·2	63·61	25·5	63·61
10 weeks	32 6	32 48	32 1	31·45
12 weeks	40·6	33·55	39·2	34·00
14 weeks	50·7	37·21	47·8	40·18
16 weeks	58·3	37·66	53·7	44·43
18 weeks	62·5	39·00	57·6	37·02
20 weeks	72·5	44·66	66·1	41·33
22 weeks	80·0	48·26	76·6	53·66
Total weight of food consumed in ounces ..		336·43	..	345·68
Total cost of food consumed in pence ..		22·21	..	20·86

From the foregoing figures it will be noted that in both cases there is a definite and continued rate of development up to the age of fourteen weeks; that the rate of development on the high protein ration is greater than upon the low protein ration; that from the fourteenth week there is a decline in the rate of development for a period, but from eighteen weeks onwards development takes place at a rate similar to that of the earlier period.

The figures taken as a whole suggest that increased protein is desirable with Australorps until the fourteenth week, and that from then the rate of body development is not sufficient to warrant the continuance of a high protein ration. (Compare Section 2.)

MORTALITY.

A most pleasing feature of the experiment was the relatively low mortality. The following table gives the death rate up to the eighth week:—

TABLE 7.

Period.	High Protein Ration.		Low Protein Ration.
	Australorps.	Leghorns.	Leghorns.
Number placed in brooder	100	100	101
1 week	6	5	5
2 weeks	1	1	..
3 weeks	..	..	..
4 weeks	..	..	..
5 and 6 weeks	..	2	..
7 and 8 weeks	..	..	1

OUTBREAK OF COCCIDIOSIS.

When the chickens were four weeks of age an outbreak of Coccidiosis occurred. Chickens in all pens were passing blood freely. Immediate treatment was resorted to and the losses due to this disease were reduced to three chickens. The treatment adopted was as follows:—A mixture of Iodine (resublimate), ¼ oz.; Potassium Iodide, ½ oz.; Water, 25 oz., was made. Three ounces of this solution was added to a quart of fresh skimmed milk and heated until it became white. This milk and iodine mixture was then added to 2 gallons of drinking water. Treatment was continued until the birds were seven weeks of age.

SUMMARY.

The test has demonstrated in no uncertain manner the following:—

(1) Feeding a ration, the protein content of which is relatively higher than that normally used during early life, assists in development and increases stamina. This is particularly valuable in the rearing of late hatched chickens.

(2) A high protein ration facilitates the separation of sexes in Leghorns—a feature of economic importance to those who do not raise cockerels for market.

(3) (*a*) The efficiency with which the Australorp cockerel converts food as compared with the Leghorn.

(*b*) The following table helps to establish (3) (*a*):—

QUANTITY OF FOOD CONSUMED PER 1 LB. OF LIVE WEIGHT GAINED.

Period.	Australorps.	Leghorns.
	Oz.	Oz.
9 weeks	39·16	43·78
12 weeks	45·74	53·91
15 weeks	48·90	58·35
18 weeks	52·30	67·35
21 weeks	58·63	..

(4) If breeders are unable to rear Australorp cockerels profitably for table purposes it is of little use for them to try to rear Leghorns.

(5) In this experiment a high protein ration appears to have given no advantage when fed to Leghorns after the age of twelve weeks, and in the case of Australorps, after fourteen weeks.

ACKNOWLEDGEMENT.

For material and generous assistance in the compilation of this report the author is indebted to Messrs. E. H. Gurney, H. J. H. Hines, and members of the Honorary Poultry Advisory Committee.

PRODUCTION RECORDING.

List of cows, officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Guernsey Cattle Society, and The Friesian Cattle Society, production charts for which were compiled during the month of May, 1932 (273 days period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Blossom of Penrhos	Mature ..	16,367	699·149	A. Sandilands, Wildash
Nellie 3rd of Sunnyview ..	Mature ..	14,717·45	616·107	W. H. Thompson, Nanango
Lilac	Mature ..	12,284·75	527·937	S. Mitchell, Warwick
Daisy 9th of Oakvilla	Mature ..	7,595·22	446·527	H. Marquardt, Wondai
Cherry of Penrhos	Mature ..	10,337	439·950	A. Sandilands, Wildash
Ruby of Corunna	Mature ..	9,694·83	429·641	J. Phillips, Wondai
Stately of Fairholme	Mature ..	11,424·65	425·864	Q.A.H.S. and C., Gatton
Tina II. of Yaralla	Mature ..	10,574·51	399·655	Hickey and Sons, Wilston
Westbrook Molly	Mature ..	10,278·22	390·557	F. G. G. Couper, Westbrook
Curly 5th of Arley	Mature ..	9,348·05	385·244	E. D. Lawley, Maleny
Strawberry of Penrhos ..	Mature ..	9,496	383·727	A. Sandilands, Wildash
Roseleaf of Hill Top	Mature ..	11,584·92	367·366	J. A. Heading, Cloyna
Handsome 6th of Rosenthal ..	Snr. (4 yrs.)	10,508·5	412·439	S. Mitchell, Warwick
Dinah 4th of Westbrook ..	Snr. (4 yrs.)	8,253·2	366·228	F. G. G. Couper, Westbrook
Trump 3rd of Rosemount ..	Snr. (4 yrs.)	7,611·25	339·078	J. Robertson, Bingera Siding
Dainty 3rd of Arley	Snr. (4 yrs.)	8,770·4	338·781	E. D. Lawley, Maleny
Hope 8th of Rosenthal.. ..	Jnr. (4 yrs.)	7,475·75	329·137	S. Mitchell, Warwick
Amy of Hawthorne	Jnr. (4 yrs.)	9,121·91	369·236	H. M. Graham, Oakfields
Ruby III of Thurles	Jnr. (4 yrs.)	11,229·11	404·793	Hickey and Sons, Wilston
Gentle III of Blacklands ..	Snr. (3 yrs.)	8,742·1	345·118	N. V. Slaughter, Harrisville
Fussy of Kingsdale	Jnr. (3 yrs.)	9,279·2	425·058	A. A. King, Mooloolah
Lass II of Oakvilla	Snr. (2 yrs.)	9,292·68	367·846	W. Marquardt, Wondai
Springdale Princess VII. ..	Snr. (2 yrs.)	8,990·06	356·685	A. J. Caswell, Wongalpong
Lilac 2nd of Rosenthal ..	Snr. (2 yrs.)	7,450	300·401	S. Mitchell, Warwick
Model 2nd of Alpha Vale ..	Jnr. (2 yrs.)	10,373·15	436·435	W. H. Thompson, Nanango
Rose of Sunnyview	Jnr. (2 yrs.)	10,869·3	416·923	J. Phillips, Wondai
Irene of Sunnyview	Jnr. (2 yrs.)	10,453·27	416·537	J. Phillips, Wondai
Rosette of Sunnyview	Jnr. (2 yrs.)	9,154·68	395·541	J. Phillips, Wondai
Kitty of Sunnyview	Jnr. (2 yrs.)	9 431·57	390·945	J. Phillips, Wondai
Clara of Westbrook	Jnr. (2 yrs.)	6,852·2	313·306	F. G. G. Couper, Westbrook
Widgee Waa Beauty V. (272 days)	Jnr. (2 yrs.)	8,503·55	299·338	A. J. Caswell, Wongalpong
Envy of Blacklands	Jnr. (2 yrs.)	8,089·05	289·717	A. Pickels, Wondai
Phyllis of Penrhos	Jnr. (2 yrs.)	7,009	282·871	A. Sandilands, Wildash
Buttercup 4th of Arley ..	Jnr. (2 yrs.)	6,486·7	275·651	E. D. Lawley, Maleny
Peggy VI. of Golelea (265 days)	Jnr. (2 yrs.)	6,684·54	268·315	E. M. Franklin, Wongalpong
Dualwon Countess	Jnr. (2 yrs.)	6,714·79	266·457	A. J. Caswell, Wongalpong
JERSEY.				
Oaklands Larkspur Lass 4th ..	Mature ..	8,343·5	542·447	A. N. Webster, Maleny
Carlyle Larkspur 5th	Mature ..	6,678·28	370·819	J. Williams, Wondai
Carlyle Larkspur Countess ..	Snr. (4 yrs.)	8,650·712	440·520	J. Williams, Wondai
Glengariffe Nobles Foxglove ..	Snr. (4 yrs.)	6,304·8	331·437	Cox Bros., Maleny
Nobly Born Irondeal	Snr. (3 yrs.)	7,181·77	413·12	Sinnamon and Sons, Moggill
Morag 3rd of Peachester ..	Snr. (3 yrs.)	5,720·05	356·502	D. Macdonald, Peachester
Trinity Gerbera	Snr. (3 yrs.)	6,232·6	320·765	E. J. O'Keeffe, Nambour
Newhills Queenie 2nd	Snr. (3 yrs.)	5,598·6	319·343	J. N. Robinson, Maleny
Wonderful Maid	Jnr. (3 yrs.)	7,989·06	399·378	Sinnamon and Sons, Moggill
Pavillans August Segunda ..	Jnr. (3 yrs.)	6,669	329·291	Sinnamon and Sons, Moggill
Dina 9th of Viola	Snr. (2 yrs.)	5,906·02	338	H. T. Mayers, Nambour
Carnation Lockets Pride ..	Snr. (2 yrs.)	5,996·34	325·515	Spresser and Sons, Brassall
Avocaview Golden Lady 2nd ..	Snr. (2 yrs.)	6,274·3	279·28	A. M. Webster, Maleny
Daisy of Billabong	Jnr. (2 yrs.)	7,416·56	371·869	J. Mollenhauer, Moffatdale
Sybel of Calton	Jnr. (2 yrs.)	6,769·1	354·364	C. Burow, Goomeri
Dainty Idyle of Burnleigh ..	Jnr. (2 yrs.)	6,066·78	320·914	W. W. Mallett, Nambour
Nobles Favourite of Glenmoore	Jnr. (2 yrs.)	6,292·5	305·215	J. and R. Williams, Kingaroy
Bella Scott of Brooklands ..	Jnr. (2 yrs.)	5,678·04	295·539	J. Williams, Wondai
Trinity Coquette	Jnr. (2 yrs.)	5,211·34	294·433	Sinnamon and Sons, Moggill
Wee Dot of Burnleigh	Jnr. (2 yrs.)	5,191·2	291·674	W. W. Mallett, Nambour
Trecarne Roselea 3rd	Jnr. (2 yrs.)	4,771·34	277·676	T. A. Petherick, Lockyer
Trinity Mariette	Jnr. (2 yrs.)	5,130·69	274·591	Sinnamon and Sons, Moggill
Trinity Violet	Jnr. (2 yrs.)	5,124·84	266·353	Sinnamon and Sons, Moggill
April Morn of Woodbine ..	Jnr. (2 yrs.)	5,530·74	270·114	J. Williams, Wondai
Majesty's Claribelle of Brooklands	Jnr. (2 yrs.)	5,790·465	261·171	J. Williams, Wondai
Glengariffe Nobles Coulisse 3rd	Jnr. (2 ysr.)	4,386·95	260·022	Cox Bros., Maleny
Trecarne Thelma	Jnr. (2 yrs.)	4,692·26	255·478	T. A. Petherick, Lockyer
Opal of Burnleigh	Jnr. (2 yrs.)	4,217·5	254·055	W. W. Mallett, Nambour
Retford Chimes	Jnr. (2 yrs.)	5,839·26	249·832	T. A. Petherick, Lockyer
Trecarne Rose 6th	Jnr. (2 yrs.)	4,878·86	245·993	T. A. Petherick, Lockyer
Wattleflower 2nd of Wattlegrove	Jnr. (2 yrs.)	4,284·25	244·763	J. W. Evans, Boonah
Majesty's Rose of Brooklands..	Jnr. (2 yrs.)	4,884·02	241·274	J. Williams, Wondai
Pineview Prim	Jnr. (2 yrs.)	4,777·42	294·374	Hunter and Sons, Borallon

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
GUERNSEY.				
Linwood Trefoil	Snr. (2 yrs.)	5,370·7	284·453	W. A. K. Cooke, Maleny
Linwood Best Girl	Snr. (2 yrs.)	5,527·8	279·799	W. A. K. Cooke, Maleny
FRIESIAN.				
Inavale Grace VIII.	Jnr. (2 yrs.)	8,066	293·385	A. O. Stumer, Boonah
Oaklands Holly Rock	Snr. (2 yrs.)	7,541·13	278·530	W. Richters, Tingoora

SELECTING A DAIRY HEIFER.

C. F. McGRATH, Supervisor of Dairying.

THE ability to produce large quantities of milk is the dairy heifer's heritage, and when she develops and takes her place as a producer the herdsman's ability to feed and care for her is the all-important factor that enables her to give of her best.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she is fitted by nature to develop into a good producing female.

Careful selection and breeding of high-class dairy stock establishes conformation and type, and a calf bred on dairy lines possesses dairy form and character, as distinct from the beef form and character.

The trained eye of the judge can see the dairy value of the calf and can discern the dairy type as distinct from the beef type in a heifer when quite young. The pedigree, which constitutes a compilation of facts concerning her immediate ancestry, and the production records of her ancestral dams on both the dam and sire sides are important factors in determining the future dairy value of the young heifer and as a guidance in the selection of the better class dairy stock. Constitution is important in the young heifer. A deficiency in any quality necessary to ensure a well-grown, well-developed, thrifty animal indicates that the heifer will not make a profitable dairy cow.

The form of the dairy heifer with a future as a profitable producer is in miniature a duplicate of a good type fully-developed dairy female. The dairy characteristics of the calf are indicated by an absence of any surplus flesh; she is somewhat angular and spare.

The head is typical of her breed, the eye large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. The digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample mill power to convert the food into milk. The greater the depth through the middle the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving.

The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The as yet undeveloped udder, milk veins, and wells are reliable indications of the heifer's future value as a dairy animal. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells indicate usefulness as a dairy cow.

The hair is soft, fine, and oily, and the skin thin, loose, soft, and pliable to the feel. The animal should be bright and thrifty, indicating a good constitution and capable of development by proper feeding and handling.

Select the heifer with care and do not allow the influence of pedigree to override your better judgment as to grave faults that she may possess, especially lack of constitution.

POINTS IN DAIRYING PRACTICE.

THE dairy farms of the State constitute the foundation of an industry that has developed so as to become one of the State's most important primary industries, representing an annual value of upwards of £7,000,000.

It is realised that the dairy farmer to be efficient must be more than a willing worker with a strong back and arm.

The successful dairyman is a business man adopting the most efficient methods in the conduct of his business. Foresight and efficient cultural methods will enable the dairy farmer to provide a regular supply of suitable food for the dairy herd.

Rotational grazing and top-dressing of native and introduced pasturage, production of fodder crops, and the conservation of fodder are important factors that make for efficiency in the industry. Having made provision for a supply of fodder it is necessary to check the production of each individual cow in order to secure the profitable utilisation of the food consumed by the removal from the herd of all animals that do not reach a payable standard of production.

The efficient dairy cow properly fed and cared for is akin to an efficient machine in a modern factory supplied with the required material for conversion into a desired product.

The cow converts the bulky fodders grown on the dairy farm into the condensed form of milk which, through the operations of our modern equipped dairy factories, is still further condensed into butter and cheese. The value of butter and cheese exported overseas annually approximates a value of £4,500,000.

The average production of the herd is an all-important factor in the success or failure of the undertaking, and is directly influenced by the return from each low-yielding cow as well as by that of the higher producers. Efficient methods will not allow of the retention in the herd of producers below a payable standard with the consequent loss of profit returned by the higher producers. The low producers reduce the average return from the herd, and in some instances eat up all the profits, and must not be influenced by the high yields of a few individual cows in the herd, as it is the average production of the herd over the full milking period that really counts.

The elimination of unprofitable producers allows of an actual saving in feed and labour, and makes for efficiency.

Dairy farming, like every other business, has two main activities—first, to produce what the market requires at a reasonable cost; and secondly, to sell the products to the best advantage. Organised marketing is receiving the attention of the various boards constituted under the provisions of the Primary Producers Organisation and Marketing Act, where increased attention is being given to the various phases of the production sections of the industry by improvement of pastures, growing of fodder crops, the conservation of fodder, and production recording.

The topic of herd recording has been given prominence to in the press and by various bodies associated with the industry. A large number of dairy farmers do not fully realise that their progress and the prosperity of the industry depends upon the management of the dairied land and the individual return from each cow constituting the dairy herd. The number of cows submitted for production recording represent but a small proportion of our dairy herds.

It is an economically sound practice to submit the herd to production recording, which must cover the full lactation period, and can with advantage be continued from year to year.

The knowledge obtained will secure efficiency in the conduct of one's business. Systematic herd testing enables the dairy farmer to advance towards a near maximum return from his herd—

(1) By the application of business principles to his operations.

(2) By determining the value of each cow's product and locating the unprofitable cow.

(3) By providing the opportunity of increasing the production of the herd, by selecting and breeding the high-producing females to a selected dairy sire.

(4) By selecting high producers it makes it possible to keep fewer cows and yet produce the same quantity of milk and fat, and ensures more economic feeding.

Herd recording increases the value of tested animals and their progeny, and promotes systematic breeding of the better class of dairy cattle.

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing.	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing.	July.	Date of Farrowing.	Aug.	Date of Farrowing.	Sept.	Date of Farrowing.	Oct.	Date of Farrowing.	Nov.	Date of Farrowing.	Dec.	Date of Farrowing.
1	22 April	1	23 May	1	20 June	1	21 July	1	20 Aug.	1	20 Sept.	1	20 Oct.	1	20 Nov.	1	21 Dec.	1	20 Jan.	1	20 Feb.	1	22 Mar.
2	23 ,,	2	24 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	23 ,,
3	24 ,,	3	25 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	24 ,,
4	25 ,,	4	26 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	25 ,,
5	26 ,,	5	27 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	26 ,,
6	27 ,,	6	28 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	27 ,,
7	28 ,,	7	29 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	28 ,,
8	29 ,,	8	30 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	29 ,,
9	30 ,,	9	31 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	30 ,,
10	1 May	10	1 June	10	29 ,,	10	30 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	30 ,,	10	29 ,,	10	1 Mar.	10	31 ,,
11	2 ,,	11	2 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	2 ,,	11	1 April
12	3 ,,	12	3 ,,	12	1 July	12	1 Aug.	12	31 ,,	12	1 Oct.	12	31 ,,	12	1 Dec.	12	1 Jan.	12	31 ,,	12	3 ,,	12	2 ,,
13	4 ,,	13	4 ,,	13	2 ,,	13	2 ,,	13	1 Sept.	13	2 ,,	13	1 Nov.	13	2 ,,	13	2 ,,	13	1 Feb.	13	4 ,,	13	3 ,,
14	5 ,,	14	5 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	5 ,,	14	4 ,,
15	6 ,,	15	6 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	6 ,,	15	5 ,,
16	7 ,,	16	7 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	7 ,,	16	6 ,,
17	8 ,,	17	8 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	8 ,,	17	7 ,,
18	9 ,,	18	9 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	9 ,,	18	8 ,,
19	10 ,,	19	10 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	10 ,,	19	9 ,,
20	11 ,,	20	11 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	11 ,,	20	10 ,,
21	12 ,,	21	12 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	12 ,,	21	11 ,,
22	13 ,,	22	13 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	13 ,,	22	12 ,,
23	14 ,,	23	14 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	14 ,,	23	13 ,,
24	15 ,,	24	15 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	15 ,,	24	14 ,,
25	16 ,,	25	16 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	16 ,,	25	15 ,,
26	17 ,,	26	17 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	17 ,,	26	16 ,,
27	18 ,,	27	18 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	18 ,,	27	17 ,,
28	19 ,,	28	19 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	19 ,,	28	18 ,,
29	20 ,,	—	—	29	18 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	18 ,,	29	17 ,,	29	20 ,,	29	19 ,,
30	21 ,,	—	—	30	19 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	19 ,,	30	18 ,,	30	21 ,,	30	20 ,,
31	22 ,,	—	—	31	20 ,,	—	—	31	19 ,,	—	—	31	19 ,,	31	20 ,,	—	—	31	19 ,,	31	22 ,,	31	21 ,,

NOTE.—Black figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April; a sow mated on 1st July is due on 20th October. The chart should be preserved for future reference by breeders of all classes of pigs. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days, this period is sometimes remembered as roughly three months three weeks three days, or 16 weeks. With very young sows the period is sometimes of shorter duration, and instances are on record where young sows have farrowed at from 100 to 108 days after becoming pregnant; on the other hand, old sows in abnormal condition have been known to carry their young for more than 140 days.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

ARRANGEMENTS have been completed with the Australian Broadcasting Company for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 5th July, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers. Following is the list of lectures arranged:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMPANY).

Tuesday, 5th July, 1932—"Selection of Sugar-cane for Planting Purposes." A. F. Bell, B.Sc., Plant Pathologist.

Thursday, 7th July, 1932—"Brooding Chickens." J. J. McLachlan, Poultry Inspector.

Tuesday, 12th July, 1932—"Disease-resistant Varieties of Sugar-cane—How They are Developed." A. F. Bell, B.Sc., Plant Pathologist.

Thursday, 14th July, 1932—"Red Rot and Related Diseases." W. Cottrell Dormer, B.Sc. Agric., Assistant Pathologist.

Tuesday, 19th July, 1932—"Cotton Varieties" (First Lecture). R. W. Peters, Cotton Experimentalist.

Thursday, 21st July, 1932—"Cotton Varieties" (Second Lecture). R. W. Peters, Cotton Experimentalist.

Tuesday, 26th July, 1932—"Shade Trees for the Farm." C. T. White, Government Botanist.

Thursday, 28th July, 1932—"Flowering Shrubs for the Home Garden." C. T. White, Government Botanist.

Tuesday, 2nd August, 1932—"Ornamental Climbers." C. T. White, Government Botanist.

Thursday, 4th August, 1932—"Diseases of the Grape Vine." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 9th August, 1932—"Chicken Feeding." P. Rumball, Poultry Expert.

Thursday, 11th August, 1932—"Notes on Sugar Conference at Porto Rico." A. F. Bell, B.Sc., Plant Pathologist.

Tuesday, 16th August, 1932—"Maize Varieties and Their Suitability for Various Districts." C. J. McKeon, Instructor in Agriculture.

Thursday, 18th August, 1932—"Tobacco." G. B. Brooks, Director of Agriculture.

Tuesday, 23rd August, 1932—"Tobacco Exploratory Work in Queensland." G. B. Brooks, Director of Agriculture.

Thursday, 25th August, 1932—"The Cultivation of Maize." C. J. McKeon, Instructor in Agriculture.

Tuesday, 30th August, 1932—"Importance of Efficient Cleansing and Sterilising of Dairy Utensils." C. J. Pound, Government Bacteriologist.

Thursday, 1st September, 1932—"Plant Disease Investigation." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 6th September, 1932—"Propagation of Tobacco Seedlings." R. A. Tarrant, Instructor in Agriculture.

Thursday, 8th September, 1932—"Preparation of Land for Tobacco." R. A. Tarrant, Instructor in Agriculture.

Tuesday, 13th September, 1932—"Fertilizers for Tobacco." R. A. Tarrant, Instructor in Agriculture.

Thursday, 15th September, 1932—"Cotton Planting and Cultivation." R. W. Peters, Cotton Experimentalist.

Tuesday, 20th September, 1932—"A Brief Talk to the Small Selector on the Ordinary Operations on a Sheep Selection throughout the year." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 22nd September, 1932—"Diseases of Pumpkins and Allied Crops." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Tuesday, 27th September, 1932—"Parasites and Methods of Control" (First Lecture). James Carew, Senior Instructor in Sheep and Wool.

Thursday, 29th September, 1932—"Parasites and Methods of Control" (Second Lecture). James Carew, Senior Instructor in Sheep and Wool.

CLIMATOLOGICAL TABLE—MAY, 1932.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	83	72	85	5, 6, 7, 20	70	14, 16, 24, 25, 26, 27, 31	378	18
Herberton	..	71	59	80	19	51	24, 25, 30, 31	497	20
Rockhampton	30·12	78	61	83	1, 4, 6	55	25	315	12
Brisbane	30·21	72	58	77	10	54	25	166	11
Darling Downs.									
Dalby	30·19	71	48	78	7	40	10, 11	55	3
Stanthorpe	..	63	44	72	7	32	11	112	18
Toowoomba	..	66	48	70	1, 2, 3, 4, 5, 6	40	2	112	9
Mid-interior.									
Georgetown	29·97	86	65	93	21	57	24	14	2
Longreach	30·09	78	55	87	6, 7	48	1, 23, 25	289	5
Mitchell	30·17	71	47	81	7	38	11	190	7
Western.									
Burketown	29·99	85	65	90	10	55	24	8	2
Boulia	30·06	80	56	89	5	48	1, 2	175	4
Thargomindah	30·16	72	54	83	6	47	11, 24, 25	236	5

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1932.	May, 1931.
North Coast.	In.		In.	In.
Atherton	1·95	31	6·65	2·05
Cairns	4·35	50	11·76	4·04
Cardwell	3·51	60	7·97	4·34
Cooktown	2·85	56	3·68	1·56
Herberton	1·59	45	4·97	1·54
Ingham	3·37	40	10·97	3·99
Innisfail	12·16	51	19·57	7·10
Mossman Mill ..	3·44	19	10·53	2·29
Townsville	1·30	61	2·25	0·49
Central Coast.				
Ayr	1·10	45	3·04	1·31
Bowen	1·31	61	2·16	0·80
Charters Towers ..	0·78	50	1·61	0·09
Mackay	3·72	61	5·33	2·56
Proserpine	4·23	29	6·95	2·84
St. Lawrence.. ..	1·76	61	3·21	0·67
South Coast.				
Biggenden	1·73	38	1·23	2·04
Bundaberg	2·66	49	2·09	4·39
Brisbane	2·81	81	1·66	2·20
Caboolture .. .	2·91	45	1·23	3·44
Childers .. .	2·16	37	1·14	3·20
Crohamhurst ..	5·00	39	2·38	4·34
Esk .. .	2·00	45	0·77	1·36
Gayndah	1·57	61	1·11	1·93
Gympie ..	2·88	62	1·36	3·12
Kilkivan	1·85	53	0·56	2.29
Maryborough ..	3·08	60	1·17	2·46
South Coast—continued:	In.		In.	In.
Nambour	4·80	36	2·34	4·52
Nanango	1·53	50	0·91	2·66
Rockhampton ..	1 49	45	3·15	2·05
Woodford	2·95	45	1·11	2·53
Darling Downs.				
Dalby	1·30	62	0·55	1·25
Emu Vale	1·20	36	0·83	3·46
Jimbour	1·20	44	0·73	1·19
Miles	1·50	47	1·04	1·35
Stanthorpe	1·88	59	1·12	3·61
Toowoomba ..	2·20	60	1·12	2·84
Warwick	1·57	67	0·85	3·48
Maranoa.				
Roma	1·42	58	2·16	1·37
State Farms, &c.				
Bungeworgorai ..	0·86	18	2·44	1.42
Gatton College ..	1·58	33	0·52	1·07
Gindie	0·92	33	1·32	0
Hermitage	1·26	26	0·66	3·56
Kairi	1·80	18	0·70	1·13
Mackay Sugar Experiment Station ..	3·24	35	4·52	1·66

J. H HARTSHORN, Acting Divisional Meteorologist.

Answers to Correspondents.

Poison Peach.

W.B. (Mackay)—

The specimen is the Peach-leaf Poison Bush or Poison Peach, *Trema aspera*, a shrub very common in coastal Queensland and New South Wales, and generally regarded as poisonous to stock. It develops at times a prussic acid yielding glucoside, and at these times if eaten in quantity should cause death. The occurrence of this poisonous principle, however, is very erratic, and what controls its formation it is impossible to say. Though regarded by many people as a plant poisonous to stock, nevertheless we have often seen stock eating very large quantities of it without any ill-effects following.

Valuable Tropical Legume.

INQUIRER (Brisbane)—

The specimen of legume from the Daintree River is *Desmodium scorpiurus*, a species of Tick Trefoil. It is a common legume in many tropical countries, and is supposed to have been introduced into North Queensland from Samoa many years ago. Where it grows it is regarded as a very valuable tropical legume for fodder purposes.

Glycine tabacina.

W.G.C. (Coominya)—

The specimen is *Glycine tabacina*, a native legume very common in the average native mixed pasture and generally regarded as a good fodder. Though it is common, we have not heard a local name given to the plant. Rape is not a legume, but a member of the cabbage and turnip family.

Chenopodium carinatum.

W.R.H. (Townsville)—

The specimen is *Chenopodium carinatum*, a strongly scented weed with a very wide range in Australia. We have not heard a common name for it, but it is very closely allied to the Worm Seed and the oil from the seeds would probably have similar properties as a vermifuge. It occurs commonly as a weed in cultivation, and is also found on plains and along watercourses in the West. We think it is a native of North Queensland, though stock carry the plant from one place to another. We collected it many years ago as far north as the Flinders River, not very far from Julia Creek.

Fodder Crops.

W.S. (Oakey).—Mr. C. J. McKeon, Instructor in Agriculture, advises as follows:—

Feterita is grown for grain purposes and is not of much value for fodder. Like all members of the sorghum family it cannot be fed with safety when at an immature stage. When frosted it would be of very little value as stock food. It cannot be compared with Sudan grass or any of the panicum as a fodder. You would be well advised if you want to grow sorghum to try saccaline or Sudan grass, the latter being very suitable for your district. Cultivation required is only the same as that for crops such as maize. Land should be well worked up to a depth of 8 or 9 inches.

Sorghum should be sown in drills 3 feet 6 inches apart. It is easier to harvest and will not lodge so readily when sown in this way. The quantity of seed required is from 4 to 5 lb. an acre.

Sudan grass can be sown in drills about 2 feet 6 inches apart, or broadcast, 3 to 4 lb. an acre in drills and about 12 lb. broadcast.

Nut grass cannot be eradicated if the area is badly infested. If only small patches are present these can be destroyed by digging a hole 2 or 3 feet deep and greater in circumference than that of the nut grass patch and filling the hole with wood and burning. The heat thrown off will destroy any nuts which have not been removed during digging.

Usually when lucerne is fit to cut the crop is roughly two-thirds in flower. A fresh growth will also be noticed at the base of the plant. When this occurs the lucerne should be cut.

General Notes.

Staff Changes and Appointments.

Messrs. F. G. Collins, W. C. Mayson, and W. T. Parker have been appointed honorary rangers under the Animals and Birds Acts, the firstmentioned in respect of Rosedale Station and the lastnamed for sanctuaries in the Toowoomba district.

Constable F. Dornbusch, of Goomeri, has been appointed also an Inspector under the Slaughtering Act.

Mr. A. F. S. Obman, Government Veterinary Surgeon, Department of Agriculture and Stock, Brisbane, has been appointed also a Veterinary Inspector under and for the purposes of "*The Diseases in Stock Acts,* 1915 *to* 1931," "*The Slaughtering Act of* 1898," and "*The Dairy Produce Act of* 1920."

Messrs. J. Sallatina and C. Lafferty have been appointed Honorary Rangers under the Acts in respect of the Hughenden Golf Club sanctuary, and Mr. W. H. Edwards for the Boyne Island sanctuary.

The following have been appointed Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss A. Walsh (Babinda), Miss E. Christen (Cattle Creek), Miss A. L. Lovy (Inkerman), Mr. L. G. F. Helbach (Invicta), Mr. W. Ahern (Farleigh), Mr. H. Jensen (Kalamia), Mr. J. C. D. Casey (Marian), Mr. T. Herbert (Mossman), Miss J. Orr (Mourilyan), Mr. F. W. Trulson (Mulgrave), Mr. V. F. Worthington (Pioneer), Miss Ivy Palmer (Plane Creek), Mr. T. P. Brown (Pleystowe), Miss J. O'Flynn (Proserpine), Mr. T. V. Breen (Racecourse), Mr. W. J. Richardson (South Johnstone), Miss M. T. Smith (Tully), and Mr. G. Tait (North Eton).

The following have been appointed Assistant Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Alldridge (Pleystowe), Miss D. Bowder (Pioneer), Mr. T. F. Corbett (Kalamia), Mr. St. C. G. Fanning (Marian), Mr. C. H. Humphreys (South Johnstone), Miss C. Humphreys (Tully), Miss M. A. Lyle (Invicta), Miss M. A. Morris (Babinda), Mrs. M. Nally (Inkerman), Miss M. Orr (Proserpine), Miss V. Page (Marian), Miss E. Rowe (Racecourse), Miss M. Thorburn (Farleigh), Mr. D. Walton (North Eton), Mr. H. T. Whitcher (Plane Creek), Mr. R. D. Woolcock (Pleystowe).

Police Constables C. Wagner (Talwood), B. Nolan (Marlborough), R. L. Beahan (Baralaba), W. S. Osborne (Prairie), E. H. Kowaltzke (Ewan), and J. E. Carroll (Stonehenge) have been appointed also Inspectors under the Slaughtering Act.

Toowoomba Sanctuary.

Horn Park, Toowoomba, has been declared a sanctuary under the Animals and Birds Acts, and it will now be unlawful for any person to take or kill any animal or bird thereon.

Arrowroot Board.

The poll to decide whether the ownership of arrowroot bulbs and arrowroot flour should be vested in the Arrowroot Board was conducted by the Department of Agriculture and Stock on 15th June, when both of these questions were answered in the affirmative. Results:—

	Votes.
For the acquisition of Arrowroot Bulbs	81
Against	44
For the acquisition of Arrowroot Flour	82
Against	45

The necessary three-fifths majority having been obtained on both of these questions the proposals have therefore been carried.

Rosedale Sanctuary.

Executive approval has been given to the issue of an Order in Council under the Animals and Birds Acts declaring Rosedale Station, Rosedale, the property of Mr. F. G. Collins, as a sanctuary under the abovementioned Acts. It will now be unlawful for any person to take or kill any animal or bird within the boundaries of Rosedale Station.

Dairy Produce Act Examinations.

The date for the holding of the annual examinations in the theory of Milk and Cream Testing, Milk Grading, Cream Grading, Butter Making, and Cheese Making, is 30th July. Applications must be lodged with the Department before 12th July.

A.I.F. Members' Addresses.

The A.I.F. Historian (Dr. C. E. W. Bean), Victoria Barracks, Paddington (N.S.W.), is anxious to get in touch with the following ex-members of the A.I.F., and would be grateful for any help in this direction from readers:—George Robert Barclay, Lieut (24th Batt.); Meredith George Blackman, D.C.M., M.M., 3007 C.Q.M.S. (12th Batt.); Roy Henry Brown, M.C., Lieut. (9th Batt.); William Franklin Comrie, M.M., 1533, Driver (4th D.A.C.); George Collingwood Dodd, Lieut. (4th M.G. Coy.); Charles Telfer Emerson, M.M., 2361, C.S.M. (15th Batt.); William Greaves, D.C.M., 793, Sgt. (9th Batt.); Frederick Hallam, M.C., Captain (49th Batt.); William Alexander Porter, D.C.M., 5448, C.S.M. (9th Batt.); Granville Pritchard, M.C., Lieut. (15th Field Coy.); Charles Henry Roberson, M.M., 1700, Sergeant (26th Batt.).

Maturity Standards for Citrus Fruits.

Representatives of the States concerned, the Federal Citrus Council of Australia, and the Committee of Direction of Fruit Marketing have agreed to a higher maturity standard for citrus fruits, and in accordance with their recommendation, "The Fruit and Vegetable Grading and Packing Regulations of 1928" issued under "*The Fruit and Vegetables Act of* 1927," have to-day been amended to provide for the new standards.

"Matured fruit" in the meaning of the original regulation in the case of oranges and mandarins, meant fruit in which the citric acid content shall not exceed one and one-half per centum, and the weight of the hand-pressed juice of the fruit shall be not less than fifteen per centum of the total weight of the orange or mandarin.

The amendment now provides that "matured fruit" shall mean in the case of oranges, grape fruit, and mandarins, fruit in which the weight of the hand-pressed juice is not less than thirty per centum of the total weight of the fruit, and—

(*a*) As regards navel oranges and mandarins, ten cubic centimetres of which juice is neutralised by not more than twenty-six cubic centimetres of deci-normal (N/10) alkali; and

(*b*) As regards oranges (other than navel oranges and mandarins), ten cubic centimetres of which juice is neutralised by not more than thirty cubic centimetres of deci-normal (N/10) alkali.

Uniformity in the size of cases used for marketing citrus in this State has also been provided for grape fruit and oranges shall be packed only in the following cases:—

One bushel case, the inside measurements of which are 18 inches long by 14¼ inches deep by 8⅝ inches wide, and the capacity of which is not less than one imperial bushel or cubical content of 2,223 cubic inches;

Canadian standard case, the inside measurements of which are 18 inches long by 10½ inches wide by 11½ inches deep, and the capacity of which is not less than 2,173½ cubic inches. A further amendment provides that the Canadian citrus case shall comply with the measurements of the standard citrus export case recently adopted by the Federal authorities.

Sanctuary Proclaimed.

Executive approval has been given to-day to the issue of an Order in Council under the Animals and Birds Acts, declaring Boyne Island (Benaraby), the property of the Hughenden Golf Club, and the property of R. A Childs, Burpengary, to be sanctuaries under and for the purposes of the abovementioned Acts. It will be unlawful to take or kill any animal or bird on the abovementioned properties.

Disposal of Pineapple Tops.

Approval has to-day been given to the issue of a Proclamation under the Diseases in Plants Acts, declaring the area comprised within the boundaries of the City of Brisbane to be a quarantine area under the abovenamed Acts, and determining the nature of the quarantine to be imposed therein, namely, the prohibition of the removal, except for the purpose of destruction, of any pineapple tops, detached from the fruit, within the area in question. An exception is made in that an inspector may allow such removal, but only in accordance with the terms and conditions of a permit issued by him. The object of the Proclamation is to ensure supervision over any pineapple tops that may be used for planting purposes.

Canary Seed Board.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, giving notice of the intention of the Governor in Council to provide and declare that the commodity known as canary seed shall be divested from the growers and become vested in and be the property of the Canary Seed Board as the owners thereof.

A representative petition was received from canary seed growers asking that the Board be given the ownership of canary seed, and the Order in Council issued to-day accordingly provides for a petition to be lodged on or before 25th July, 1932, signed by not less than twenty-five growers who have grown or have been growing canary seed for sale within the past two years, requiring that a vote of growers be taken on the question of whether the ownership of canary seed shall be vested in the Board.

No Open Season for Opossums and Bears.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) announced to-day that it was not proposed to declare an open season for the trapping of opossums or native bears during the present year.

In arriving at this decision the Government was actuated by a desire to permit of the conservation and propagation of these animals. The numbers of opossums were largely depleted during the past four open seasons in 1926, 1927, 1929, and 1931, when a total of approximately 7,250,000 opossum skins were sold in this State. These figures emphasise the necessity for protective measures for a reasonable period, and reports from departmental officers support this policy, as a reduction in numbers in comparison with previous years has been noted in the principal breeding districts of the State.

Mr. Bulcock also drew attention to the necessity for protecting the trapper against loss in his operations. Owing to depressed continental conditions, the oversea market values for skins have depreciated to such an extent that there is at present no reasonable margin of profit for the trapper. As an instance of the fall in value, the Minister pointed out the disparity in the prices obtained in the 1929 and 1931 sales, when prices dropped from 60s. per dozen in the former year to 18s. 5d. per dozen in the latter. In addition, from latest oversea advices, 500,000 opossum skins still remain unsold on the London market.

Mr. Bulcock expressed a definite opinion that a fair proportion of the revenue from royalty payments and licenses, which had hitherto been a charge against the trapper and had been paid into a Trust Fund for expenditure in the conservation, propagation, and protection of native fauna, should be expended for these purposes. He had now under consideration certain proposals to give effect to this policy.

Process for Tanning Small Furred Skins.

Opossum, native bear, and other small furred skins can be successfully tanned by the following process:—Mix three heaped tablespoons of powdered alum, one of borax, and one of salt, with enough water to make a thin paste. Spread on skin till well covered, but not too thick, and then fold, flesh side inwards, and roll up. Put away in a cool place. In twenty-four hours repeat the application, and in another twenty-four hours sprinkle the skin thoroughly with water and take in both hands and work and rub well to make pliable. Be careful, as it will tear easily.

After rubbing, put on some more mixture, and in a few hours work it again. The more it is worked the quicker and better it will tan.

If the skin does not seem soft enough, sprinkle some borax on it and wet well with water. In a few hours work it till it is dry, when it should be ready to use. The alum is to whiten and tan, the borax to soften, and the salt to keep the pelt moist while tanning. If it dries out between times, sprinkle with water.

Care of the Separator.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to reinfect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Rural Topics.

Bacon from Frozen Pork.

An experiment of considerable interest to pig producers in New Zealand (and also in Australia, and in Queensland in particular) and to consumers in Great Britain was recently organised in London by the New Zealand Association of Bacon Curers. The object of the experiment was to demonstrate that is is possible to manufacture good quality bacon from frozen pork. This is well known to a few, but it was desired to bring home to the whole body of interested producers and consumers by actual demonstration that bacon of a certain quality can be produced when efficiently cured.

Frozen pork of New Zealand production has been cured and made into bacon for several years past in Great Britain, and curers who have used it have always spoken very highly of the quality. The bacon produced in this experiment was subjected to examination, the results being regarded as extremely satisfactory. The subject is one of considerable value also to producers in each of the producing States of the Commonwealth, and is worthy of special investigation by those responsible for organising the trade. Its value should be given wide publicity.

Stud Pig Registrations in New Zealand.

It is of interest to note that the Berkshire breed is still the most popular and most liberally catered for stud pig in New Zealand, despite the competition of more recently introduced breeds.

For volume thirteen of the Herd-book to be published shortly the following applications for registration have been received:—

Berkshires	218
Tamworths	94
Large Yorkshires	73
Large Blacks	15
Middle Yorkshires	4
Duroc-Jerseys	3

or a total of 407 registrations.

The Pig's Temperature.

The normal bodily temperature of the pig is 102.6 degrees Fahr. as taken by the ordinary clinical thermometer inserted for three minutes in the rectum or uterus and read immediately it is withdrawn. Very young pigs have a slightly higher temperature, 103 degrees Fahr.; while pigs that have been driven about and have become excited and hot will probably register 103 or 103.5 degrees. It is not always an easy task taking the temperature, but the occasions where such is necessary are few and far between, and when a pig is really sick, and there is need to take the temperature, it usually is less difficult.

A temperature above normal indicates the presence of fever, while a lower bodily temperature is indicative of weaker action of the heart and of kidney complaints—i.e., inflammation of the kidneys or retention of the urine in an inflamed bladder. Rest and careful handling are essential in both cases, plus the treatment necessary for the complaint if the pig is suffering from disease. No attempt should be made to take the temperature in the mouth, and in all cases be sure the mercury in the thermometer is below 102.6 before attempting to insert the instrument in the animal's body.

Good Cooks and Bacon.

Now that bacon is so cheap, housewives will be using it in many ways other than just the popular bacon and eggs or tomatoes for breakfast. Good cooks have found that the addition of a small amount of bacon makes other dishes look and taste better. They always serve a little bacon with cutlets, sausages, &c. They cut bacon fine and add it to the stuffing of fowls and other meats. They add diced bacon to lettuce salad dressings. Here is a more ambitious bacon omelet: Beat four eggs without separating the yolks and the whites to a light froth, adding four tablespoonfuls of water, half a teaspoonful of salt, pepper to taste. Meantime cut six thin slices of bacon into the dice and fry a golden brown. Remove the bacon from the fat and keep it warm; then pour off all the fat from the pan but just enough to keep the omelet from sticking. Turn in the egg mixture. Cook the omelet carefully, and just before folding sprinkle with crisply cooked bacon. Fold and serve at once on a hot platter garnished with parsley.

Turning Frozen Pork Into Bacon—New Experiments at Cambridge.

Recent advices from London state that scientific experiments in progress at the Low Temperature Research Station at Cambridge, under the Department of Scientific and Industrial Research have proved that frozen pork which had been stored for a longer period than would be necessary to send it to Great Britain from Australia and New Zealand can still be made into very good bacon. It was with the object of finding out exactly how far frozen pig meat is liable to deterioration in cold storage during transport, and the best ways of bringing it over from the Dominions, that an investigation was started. It was carried out at Cambridge, where there is one of the best equipped low-temperature laboratories in the world. This is Government-owned, and is supported partly by grants from the Empire Marketing Board. A staff of experts is continually at work here studying the behaviour in cold storage of many sorts of foodstuffs, from pears to pork, and finding methods of improving storage and transport conditions which will help the oversea producer.

There are two ways of putting Australian and New Zealand bacon on the market. One is to send it over ready cured. The other is to export it as frozen pork and have it cured in Britain.

It has been definitely shown by scientific work that mild-cured bacon cannot yet be satisfactorily transported over long distances. So far, no simple way has been found of preventing the fat turning rancid after about six to eight weeks' storage. The alternative, however, gives satisfactory results. Bacon fully as good as the Dutch, and very little inferior to the Danish, can be made in Britain from meat sent from Australia and New Zealand as frozen pork. There is no reason, moreover, why the quality should not be improved by more care at each stage of pig production and of transport and storage of frozen carcases.

Australia and New Zealand are now Britain's chief sources of supply of frozen pork. Exports from New Zealand in 1930 were valued at £540,000. Australia's export of frozen pork for the same period totalled £227,412. As the dairy industry expands in the two Dominions the disposal of surplus pigs will become increasingly important, for pigs are a by-product of dairying. The frozen pork trade is, therefore, likely to grow steadily. These experiments will help it to do so by eliminating the distance factor so that frozen pork could be sent to any country in the world.

Making Good Use of Beastings.

The first milk from the cow after calving is called beastings, and is not made the best use of on many farms. It is really the very essence of milk, and contains more nutriment than any other taken from the cow. It is especially provided for the calf's first meals, for being of a slightly purgative nature it clears off all abnormal or rather offensive lodgments from the stomach and bowels, and at the same time brings the internal organs into proper action, so that it should be the herdsman's first object to get the newly-born calf to take a free sup from the udder. It is, however, the general practice to wean the calves from their mothers immediately after parturition and deprive them of the beastings with which they should be served. Though ordinary new milk may, and likely will, contain a good percentage of butterfat or cream, it will not contain colostrums (beastings), hence it is that numbers of calves are lost in the early days of their existence from scour or some other disorder brought about by injudicious feeding.

Rearing calves may always have their ordinary meals improved with the rich first milk, and when it is used no cake or bought meals are needed. It may also be given to pigs to improve their ordinary meals.

The duration of the beastings state of the milk depends on whether the animal be a heifer or a more aged cow, and of a rich milking breed or otherwise. Cows that have had a number of calves, and never were famed for the richness of their milk, only give about one or two meals, while heifers of such high-class milking breeds as Channel Islanders continue to give the rich meals for two or three days. Naturally, the food and condition of the cow have something to do with the duration of this state of the milk. The cow highly fed on good milk-producing food will give beastings for a meal or two longer than if she were kept on poor food, just the same as the kine calving when fat have a tendency to give them for several meals longer than poor lean cows.

The beastings are not fit for panning, nor may they be set for skimming, because the cream does not rise. Many a dairymaid has longed to turn it into butter, but mixing beastings with ordinary new milk has spoiled the whole pan. The day after the beastings state has passed away the milk may be panned in the ordinary way, and will give the richest cream and the best of butter, other things being equal.—Larousse in the Live Stock Journal (England).

Composition of Milk—Factors in its Variation.

Variation in the composition of milk may result from any of the following causes or any combination of them:—

The cow—its breed, its individuality, health, and condition.

The period of lactation.

Time of milking—morning or evening.

The part of the milk tested (whether first part or the strippings).

The food and water consumed by the cow.

Fat is a normal constituent of cow's milk, usually ranging on a percentage basis from 2.8 to 6.5 per cent., but varying (*a*) with the breed, and (*b*) with individuals of the same breed. The following table shows the range and the average of the butter-fat content of the milk cow of the different breeds:—

Breed.	Range. Per cent.	Average. Per cent.
Australian Illawarra Shorthorn	2.8 to 5	4.0
Jersey .. .. Guernsey	4.2 to 6.5	5.0
Ayrshire .. .. Friesian	2.8 to 4.6	3.8

Several factors influence the variation in the fat content of milk given by the same cow. The more important of these are temperament, climate, physical condition, breed, and feed.—A. and P. Notes, N.S.W. Dept. of Agric.

Sheep Weights in the Argentine.

The Argentine Division of Control of the Meat Trade has issued a statistical table giving the average weights and prices of the different classes of sheep killed in the Argentine plants during 1929 and 1930. The average weight of the wethers in both years was the same, 25 kilos.—i.e., 55 lb. The average weight of the ewes in 1929 was 28 kilos., or 61.6 lb., while in 1930 the average weight was 26 kilos., or 57.2 lb. The average weight of lambs and hoggets in 1929 was 17 kilos., or 37.4 lb., and in 1930 the average weight was exactly the same. The average weight of the sheep killed in the five plants operating on the South Coast, and designated as Patagonian Freezers, was in 1929 20 kilos. for wethers, equal to 44 lb. The same average was also registered in 1930. Ewes, in 1929, averaged 18 kilos., equal to 39.6 lb., while in 1930 they averaged 17 kilos., equal to 37.4 lb. Lambs and hoggets averaged 13 kilos. both years, equal to 28.6 lb.

Points in Dairy Practice.

The quality of dairy produce is considerably depreciated because of objectionable flavours or odours, "taints" which usually may be traced to the original milk. Certain weeds and some foodstuffs consumed by cows impart a strong and characteristic flavour to milk. Milk will also absorb "stable" odours if exposed to such an environment.

Weed and food flavours may be avoided by keeping the cows off weed-infested pastures and by feeding strong-flavoured foods after rather than immediately before milking. When cows are grazed on crops coming in this category the animals should be removed a few hours before milking. Taints may be ameliorated to some extent by aerating the milk in a pure atmosphere immediately after milking. Milk and cream will readily contract taints if they are stored in the vicinity of fruit, vegetables, soap, leather, or anything that has a strong smell.

Other flavours result from the action of fermentative organisms, but the observance of the strictest cleanliness is the surest safeguard (points out a South African departmental publication). All vessels coming into contact with milk should be kept scrupulously clean and sweet, and scalded with boiling water prior to use. Dairy utensils should be washed immediately after use; they should not be left for several hours, or the milk and cream will dry on the surface of the tinware, requiring extra time and labour in the subsequent washing. Boiling water should only be used on them after they have been given a thorough preliminary cleansing with lukewarm water. A brush should be used—not a cloth. Most tin utensils, when the final washing is done in boiling water, will dry unaided when put out to air.

Immediately the cream cans arrive back from the factory their lids should be removed and the cans tilted in an inverted position for airing. They will subsequently require a thorough scalding before being used again.

Fodder on the Farm.

Good feed can be too precious for it ever to be justifiable to allow it to go to waste, and in districts where the growth cf herbage in the spring is likely to be prolific, as in the west and north-west, pastoralists might well consider its conservation in the form of silage.

In a good year considerable quantities of valuable silage could be made from the profuse growth of clover burr, barley grass, mallow, variegated thistle, and other plants which are available in large quantities in many of our grazing districts. There are thousands of acres of pasture land, which are very free of fallen timber, stones, &c., on which mowing machines could be operated to cut this valuable feed. It can be stored in pits as a stand-by for dry times, instead of allowing it to dry off as in the majority of cases it does now, and simply provide fuel for bush fires. Clover burr hay is a very nutritious fodder, because the material contains large quantities of seed, and a few pastoralists are now recognising the wisdom of harvesting and stacking this hay as a stand-by for dry periods.

The enormous losses which periodically occur indicate the dangers that attend the carrying of stock without provision of reserves of feed to carry them through times of drought. But the figures compiled by the Government Statistician indicate only the decrease in numbers of sheep, cattle, and other farm animals; they do not show the losses which occur through a lighter and less marketable wool clip, the reduced flow of milk from dairy cows, and the reduced returns from beef and mutton. Neither do they indicate the loss which the stockowner experiences after the breaking of the drought owing to his holding being under stocked. There is no simpler and cheaper method of conserving fodder than by ensilage, and if it pays to grow crops especially for this purpose, as undoubtedly it does, how irrational is it to let suitable growth made available without the trouble of sowing go to waste.

Where silage is intended for sheep the pit method is undoubtedly the best, for by it silage can be made with the minimum amount of labour and with a minimum loss of material. The pit is not rivalled by even the most up-to-date silo, as with the latter the material must be chaffed, which means greater expense both in making the silage and also in feeding it to stock. In the case of the pit the crop is put in whole, and when taken out it needs only to be spread over clean ground for the stock, whereas the chaffed material that goes into an overhead silo must be put out in feeding troughs of some kind.

Hand versus Machine.

According to the "Farmer and Settler" (New South Wales), advocates of milking machines had a great victory in a debate on hand versus machine milking at the Agricultural Bureau conference at Hawkesbury College last week.

Mr. A. S. Pankhurst, of Singleton, held that the modern milking machine had removed the drudgery that was the bugbear of dairying, and advanced three points in support of his argument in favour of machine milking: (1) The machine solved the problem of obtaining suitable labour; (2) It was the more sanitary method; and (3) Was more acceptable to the cow.

"Dairy farming to-day, with modern machinery, is a gentleman's life, compared with what it was previously," he said.

In addition, actual figures in bacteriological tests proved machine milking the most sanitary method.

As regards the third point, it was found that with heifers that had never been milked by hand, machine milking extended the milk production period dangerously near to the lactation. For this reason, care was needed in drying off the cows. Mr. Pankhurst contended that this was not a serious disability, and said that nature intended the cow to give her milk to her young by the suckling of the calf. The machine was the nearest approach to this method yet devised.

Referring to cows that had always been milked by hand and that objected to machines, Mr. Pankhurst said that in most cases such animals had outlived their usefulness. They should be got rid of, and the young stock broken in to machines.

Mr. F. J. Pankhurst, also of Singleton, said that it was hard to understand why, in this twentieth century, it was necessary to discuss this matter. With machines it was possible to milk thirty cows an hour, and one man with machines was as good as three hand-milkers.

Mr. W. Waddell, another Singleton dairy farmer, said that machines were better, cleaner, and quicker than hand milking. The cows were not so long in the yards, which was an advantage, because to get high production it was necessary

that the cows should be given ample time to make the milk. In New Zealand, 90 per cent. of the dairymen used milking machines, and he asked who got the better price for butter in London, New Zealand or Australia?

Supporters of hand milking stated that the chief objection to the machine was its initial cost and upkeep. Labour to-day (said Mr. R. H. Hudson) was plentiful and cheap, and milking could be done just as cheaply by hand as by machine. Machines were instrumental in spreading contagious mammitis, and he quoted instances, in the Albion Park district where faulty cream had been received from farms using machines.

Mr. O. Guthrie declared that most of the second-grade cream in his district had been traced to holdings on which machines were used, and said that on his own farm he had found machines so unsatisfactory that he had disposed of them.

Mr. Lindsay Evans, of Dapto, speaking in favour of hand milking, said that three aspects were involved: (1) National (2) individual; and (3) animal. The use of machines would accentuate unemployment, and if machines and fuel were imported, it would increase the present adverse trade balance. He pointed out that the State's best purebred herds were hand milked.

The adjudicator, Mr. Balhousen, of the Department of Agriculture, declared in favour of the Singleton team.

Value of Bacon for Children.

Although bacon is usually thought of as a food for adults, it has a valued place in the diet of growing children. Now that bacon is at the lowest price of recent years, many mothers will recognise its use as a food for children and serve it more often.

School children, particularly, need the nutrition that bacon provides. By feeding a child two or three rashers of crisply cooked bacon, sufficient body warmth and energy will be created to maintain vitality until the next meal. Bacon prevents that let down of physical and mental energy and the desire for sweets of poorly fed children because much of its digestion is done in the stomach, while fruits, cereal foods, and toast rapidly liquify and are passed into the intestines. Bacon also continues to pass a steady influx of energy into the blood stream over a period of hours to meet the demands of muscle and brain cells, while other foods are rapidly used up.

Cheap Cow Rug for Winter.

Where proper shelter is not provided for stock not only is their resistance to disease reduced, but much food material is wasted in ''warming the wind,'' or in other words meeting the increased demands of an exposed body. This fact has important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the last-mentioned, shelter belts in the form of trees and hedges have considerable utility on the dairy farm, especially in colder districts and situations, and for the same reason the rugging of the animals during at any rate a portion of the winter is well worth while.

Many farmers would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together, and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted: it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical way.

Grass Silage.

As the best quality silage is produced in the heart of the stack, care must be exercised when opening to expose as small an area as possible to the air, because moulds form rapidly and the silage deteriorates in consequence. Remove the boards or bags and the soil from one portion of the stack, taking care to see that the remaining protective covering is not unduly disturbed, and cut the silage out in a face right down to the ground level before commencing on another section of the stack. The area worked on will depend on the size of the herd to be fed, but only enough should be cut out each day to supply the animals with sufficient feed for that period. An old squaring axe is one of the handiest implements for this purpose, or a special silage knife or an ordinary chopping axe can be used.

Grass silage can be used in from eight to ten weeks from the time of stacking, although if left for a longer period a more matured product will be obtained.

Graziers as well as dairy farmers are rapidly realising that ensiling surplus pasturage is a valuable method of conserving fodder, observes the Agrostologist of the New South Wales Department of Agriculture in a recent "Agricultural Gazette." An advantage of this method of conservation is that inclement weather conditions do not interfere with the operations to any considerable degree. To cure and store grass hay it is necessary, in order to produce a high quality product, that optimum drying conditions be experienced during the hay-making operations, whereas a few showers of rain falling on green material which is to be ensiled does not unduly reduce the feeding value of the cured silage.

Though there is more wastage in the stack than in the pit silo, the method is particularly useful where the sinking of a pit or trench is made difficult through the intrusion of stony outcrops, or where an impervious substratum exists, or the land is subject to seepage. Although the outer layer of a stack may dry out to some extent this material is not wasted; stock at Wollongbar and Berry Experiment Farms (N.S.W.) last season cleaned it up readily. In this dry form it resembles a fair-quality grass hay.

Cutting of surplus growth, particularly if it is too tall to be satisfactorily grazed by stock (as is frequently the case with paspalum in a good season) is an important point in intensive pasture management, the winter grasses and clovers being thereby given an opportunity to become well established and persist in the sward, thus providing a good balance of succulent feed throughout the year.

When an Amateur Goes Buying.

When an amateur goes to market to buy a dairy cow he is up against a most perplexing problem. Even skilled stockmen have some difficulty in selecting a good, useful cow. It must always be borne in mind that cowkeepers are not selling their very best cows, as a rule, unless when they begin to turn over in years and it may be a loss to keep them much longer. For this reason there is often a keen run on first-calf heifers. Being untried, these heifers are generally dear to buy, especially if they are well grown and present all the signs of becoming good milkers. Second-calf heifers can often be bought at pounds less per head than the most likely first-calf heifers. The idea is entertained that the second-calf heifers are, perhaps, being sold for some fault. A second-calf heifer is generally thin and looking her worst. She has lost the flesh and bloom she may have exhibited a year previous. She may be all right, nevertheless, and the owner's reason for selling may be because of his having too many cows. One never knows.—"Live Stock Journal" (England).

When Cows Kick.

Young cows which may have suckled their first calves, as well as the calving heifers, are sometimes not very amenable to hand-milking at the outset. A little patience and kindness must be exercised until they settle down, which they usually do after the udder assumes its normal condition. Some of the most nervous of young cows will kick when the udder is swollen hard, and the teats, perhaps, may be chapped and sore. But with kind handling they may be got to stand moderately still while being milked. Nervousness seems to be common to many cows of deep-milking qualities, hence it is advisable to soothe them and to let them eat or drink while the milking proceeds. It is not a bad plan to give a cow, old or young, a pail of water with the chill off and a handful of meal or bran and a little salt stirred into it, at milking time. This answers the twofold purpose of distracting the cow's attention from the milking and inducing her to let down her milk. Vicious kickers are hard to combat. One plan is to pass a band round both hind legs; another is to tie the tail to the hock of the near leg. Cows which are persistent kickers, and are but moderate or rather poor milkers, are best turned over to the butcher as soon as they are fat enough.

Milk That is Unsuitable.

The "colostrum," or beastings, contains an abnormally high percentage of albumen and broken-down cells from the udder, which form a most suitable food for the type of bacteria which putrefy milk and the products made therefrom. The milk of newly-calved cows should be given to the calf or used for the feeding of pigs until such time as it will boil without coagulating. It is the duty of the person in charge of the cows to keep this kind of bad milk out of the dairy, or nothing but inferior quality products can result, hence the importance of having a responsible cowman who thoroughly understands his duties.

Milk is often unfit for the successful manufacture of butter or cheese when the milking is not conducted in a cleanly manner. When the cow's udders are not cleaned previous to milking a great deal of dung and dust containing various species of bacteria falls into the milk pail at the time of milking. Another source of contamination is the milker's hands, which, if not well washed before commencing to milk, or after milking a cow with a diseased udder, will contaminate the milk drawn from the next cow. The milker should keep apart from the general supply all milk which he considers as likely to spoil the bulk if mixed with it.

Cows drink a lot of water, which it is most important should be clean, and as pure as possible. If dirty or stagnant water is supplied to cows it may have a very deleterious effect upon the milk. The water supply is of great importance on the dairy farm, and is the thing which should be given first consideration when questioning the suitability for dairying purposes. Cows should not be allowed to wade in ponds of stagnant water.—Live Stock Journal (England).

To Protect Haystacks against Mice.

Building the stack upon a raised platform answers the purpose, if the blocks upon which the platform is built are capped with galvanised-iron guards or inverted petrol tins so as to prevent the mice reaching the platform boards. Another successful method of keeping mice out is to enclose the stack with a fence of galvanised iron, either plain or corrugated, about 2 ft. high. Let the iron into the ground to a depth of 4 in., and place it in a slanting position, leaning outwards, all round the stack; take care to leave no open space at the corners. To ensure that mice do not enter a stack thus protected, care should be taken that straws, bags, or other articles are not allowed to hang from the iron fence or from the raised platform. If it should be found that mice are troublesome in the stack, poison with arsenic dissolved in water. Place dishes of the solution all round the stack; if it will not entirely eradicate the pest, this method will help to keep it in check.

Do You Know?

That the ash of young wood is especially rich in potash, and, generally speaking, the ash of young and small wood, such as young boughs, twigs, &c., is more valuable than that obtained from the trunk or heart of an old tree.

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That every gallon of milk a cow produces contains the equivalent of 1¼ oz. of phosphoric acid. Thus, a cow yielding 500 gallons of milk gives out the equivalent of 625 oz. of phosphoric acid, which is the amount contained in 200 lb. weight of superphosphate.

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That to make good concrete the sand must be clean—free from vegetable material (such as leaves, grass, &c.) and any other foreign matter. The best sand is that which has been washed. To make a rough test of the amount of dirt contained in it, rub it between the hands, when, if it is clean, there will be little or no stain.

* * * * * *

That the keeping quality of fruit depends more upon the skin being kept in a sound, unbroken condition than upon any other factor. When the skin is injured, common rot organisms gain entrance and quickly decompose it, and the rot spreads from one fruit to another. The consequences of carelessness in handling fruit are only evident to the orchardist when he learns of the low price that it has brought.

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That when trucking fat lambs, it is a good idea to leave them with their mothers till they arrive at the yards. The lambs then enter the trucks full and contented. In any case some of the ewes should be left with the lambs till they arrive at the trucking yards, otherwise the lambs will be very hard to drive and may knock themselves about unduly.—A. and P. Notes, N.S.W. Department of Agriculture.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

GOOD HEALTH NEEDS GOOD FOOD.

RECENTLY some important experiments have been made in India to test the effects on health of diets sufficient in quantity but deficient in quality. They were made on that hardy little animal the rat. About 1,000 rats were kept under ideal conditions of shelter, cleanliness, fresh air, and good water. They were fed on the diet eaten by certain peoples of Northern India. It consisted of whole wheat, fresh butter, milk, sprouted peas, carrots, cabbage, with once a week a small ration of meat and bone. The rats were kept alive to the age of two years, which would correspond roughly to the age of forty years in man. These rats were remarkably healthy. There were among them no deaths except from accident, and no disease was discovered even on post-mortem examination. They had large litters and the mothers always reared all their young ones.

Many thousand rats were kept under the same conditions but fed on deficient diets, and the results were very different. Of all the faulty diets used one of the worst was composed of white bread, margarine, tea, sugar, jam, preserved meat, and scanty overcooked vegetables—a diet in common use in England. On these deficient diets the rats developed a large number of diseases. We can mention only a few of them—pneumonia, suppuration of ear and nose, inflammation of the bowels, stone in the kidney, abscesses of the skin, anæmia, inflammation of lymphatic glands, heart disease, premature births, deaths during pregnancy and delivery. In short, these rats were unhealthy, they showed little resistance to disease, and the diseases from which they suffered are familiar to us in the human being. Similar experiments were made on a smaller scale with guinea pigs, rabbits, pigeons, and monkeys with the same results.

Without knowing it, many Queensland mothers are making the same experiments on their own children and on themselves. The same diseased conditions follow in them as in the rats fed on a common deficient English diet. This is also a common Australian diet if we substitute butter (a better food) for the margarine. Good health needs good food, and children badly fed, though they may look well, cannot resist disease. There is no need to adopt an Indian diet. The right foods are here, if we only knew them. The principal mistakes of many of our mothers are very simple.

(1) They give too little milk. Each child should have one pint daily in one form or another.

(2) Their children eat very few vegetables and these are badly cooked.

(3) They eat too much white bread and biscuits, scones, &c., made of white flour, also white rice, sago, tapico, cornflour, &c. These should be given only in moderation.

(4) They eat too much sugar at and between meals, but too little fruit, and that not at meals nor every day, but irregularly.

The question is not quite so simple as this, and we shall return to it next month.

BREAD-MAKING.

Some useful hints on a question of wide interest to country housewives were given in an address by Miss Valeria Holcombe, secretary of Burren Junction Branch of the Country Women's Association, at a recent conference of the N.S.W. Agricultural Bureau, and which are quoted below:—

A good break-making flour is essential; some flours make excellent cakes and puddings, but are not good for bread-making. This is because bread requires a flour containing plenty of gluten. Some varieties of wheat make a flour low in gluten content and these are not suitable for bread.

Yeast works best at temperatures of from 77 to 95 deg. Fahr. Keep the dough near the stove in cold weather and during heat waves put in cool place or it will rise too quickly and give a loaf that is too porous. Yeast will not work below 30 deg. Fahr., and is killed at 212 deg. Fahr. Salt retards the action of the yeast slightly; it should not be added till the dough is working well.

A little sugar improves the loaf. It prevents the crust from being too hard. The water or milk used to mix the bread with should be scalded and then allowed to cool down to lukewarm—about 103 deg. Fahr. Milk makes a very nutritious loaf with white crumb and rich crust. If all milk cannot be used try half milk and half water.

Cook for one hour; start with a hot fire (400 deg.) and decrease the temperature after a while. The cooking drives off the carbon dioxide and kills the yeast plant, so that it does not rise any more.

Troubles in Bread-making.

Over-kneaded dough is sticky and will not rise; under-kneaded dough is streaky and the bread will contain lumps of dough that have not been worked out.

Too much flour gives too stiff a dough, rises very slowly, and the flavour will be poor.

Too long a rising will give a porous loaf with poor flavour. If the rising continues too long, the bread will settle over the side of the tin or become sour.

Too cool an oven will make the bread rise too long and it will be too porous.

"Rope" is caused by a bacillus; it often appears in hot, damp weather. When the bread is about a day old the crumb goes stringy or ropey and the flavour is so disagreeable that it is quite unfit for use. This disease is hard to get rid of. The treatment is to sterilise all utensils, and add vinegar equal to 2 per cent. (one tablespoon vinegar to 1½ lb. flour) of the flour used, for all the remaining flour you have.

Recipes for Yeast.

Yeast is a microscopic plant, which, when given food, air, warmth, and moisture multiplies very rapidly and produces carbon dioxide; this stretches the gluten and the dough rises. There are three main kinds of yeast. Compressed yeast comes in small damp cakes; it is ready to work immediately it is given the food and moisture, &c., and will keep in good condition two or three days. Dry yeast is a mass of yeast plants dried and mixed with some kind of meal. Although alive, it is inactive, and even after it has been given the food, warmth, and moisture it takes some hours to start working well. It is sold in tins and will keep some months. Liquid yeast may be made at home as follows:—

Cream of Tartar Yeast.—Put 1 heaped tablespoon of hops in a saucepan with 4 cups water and boil twenty to thirty minutes. Put 1 tablespoon sugar, 1 teaspoon cream of tartar into a basin, strain the boiling hop water on to it and stir; when cold mix with 3 tablespoons flour and add 1 tablespoon old yeast. Put in basin, cover with plate, and keep in a warm place near the stove for twelve to eighteen hours. It is then ready for use. Stand in a cool place, and it will keep for a week or ten days in cool weather. Use three-quarters of a pint of this to make 3 to 5 lb. bread.

Potato Yeast.—Materials: Three potatoes, two pints boiling water, half cup flour, one-quarter teaspoon ginger, one tablespoon sugar, one and a-half tablespoons salt, half cup old yeast. Peel the potatoes, cut small, cook in the boiling water, mash potatoes. Mix next four ingredients and pour over them the potatoes and water in which they have been cooked. When lukewarm add old yeast. Keep lukewarm for twenty-four hours, put into basin, cover, and keep in cool place. Will keep two weeks.

Neither of these yeasts requires bottling or cooking.

HOME-MADE OILSKINS AND TARPAULINS.

A WRITER in an agriculturists' journal recently said that a farmer's greatest personal comfort was to be found in an oilskin coat and a pair of waterproof boots. That is not so true in Australia as in lands where the skies are more "weepful," but there are few that will say an oilskin is not an essential to farm work.

Very few farmers make their own oilskin coats, yet they need them so constantly in wet weather, and give them such rough usage, that they would probably find it profitable to make rather than to buy. When they do go buying they ransack the stores in a fruitless search for something that will keep out the water, and at the same time remain whole with ordinary farm usage. But good oilskins cost money. The farmer who would make his own must not cut his coat according to his cloth, but procure plenty of the material, for an oilskin coat is none the worse for being too big for a close fit. He should secure the very best quality of calico procurable, for good material takes no longer to make up than poor stuff does, and it lasts more than twice as long.

The first step in the making is to rip up the seams of an old cast-off oilskin, to mark out on the new calico the corresponding measurements, and then to cut out the pieces required. When these have been seamed together, we have the new calico coat, which ultimately becomes the oilskin. If a light-coloured coat is desired, the coat should be oiled with a preparation made as follows:—Boiled linseed oil, one pint; raw linseed oil, half a pint and terebene a quarter of a pint. Another recipe is:—Boiled linseed oil, one quart, terebene, two tablespoonfuls. The raw oil makes the coat more supple than the boiled, but the boiled dries quicker, and the terebene is a liquid drier intended to hasten the process. The first of the two recipes will give a lighter colour than which is composed of boiled-oil and terebene only.

Oilskins are best made in the summer when a larger proportion of raw oil can be used. Made in the winter there should be more boiled oil and more terebene.

If it is desired to make a coat black, a quarter of a pound of dry vegetable black should be mixed with either of the above. The best way to mix it is to moisten the black with just enough of one of the oils to make a paste, either working it on a plate or a sheet of glass with a knife, or in a basin with a spoon or a piece of stick. The object of this is to break up the lumps. A black preparation such as this should also be strained through cheese-cloth, or some other coarse open fabric. The man with a taste for colour can have a green or a red or a blue oilskin by substituting for the black any dry colours to suit.

The method of applying the oils is as follows:—The coat is stretched on the floor and is painted with a brush, going carefully all over, and making sure that the oil penetrates right through at the seams and wherever the material is doubled. After painting, the coat should be hung over a line with the position occasionally changed until it dries. It may need a second coat, and as a good general rule two thin coats are always better than one thick one.

Some experimenters have adapted the tarpaulin method to suit their needs. That is, they first paint the coat all over inside; then, before it is dry, paint all over the outside.

Waterproofing Tarpaulins.

What is called the "railway" method of oiling tarpaulins is as follows:—Stretch the tarpaulin out on the floor, and paint each side once with a mixture of two parts of raw and one part of boiled linseed oil, to which enough vegetable black has been added to colour the tarpaulins as desired. The composition should be thoroughly worked in, and then allowed to dry. This dressing should be given twice. When thoroughly dry, still another coat should be given, consisting of two parts of boiled and one part of raw oil, with the amount of vegetable black desired. Care should be taken that the tarpaulin is perfectly dry before giving the last application. This is important.

The method of colouring is as given above for oilskin coats. In winter it is advisable to add to the Government recipe a little terebene, as this assists dying.

Besides the method of oiling detailed, there is a cheap method for temporary purposes that is worth knowing. Into one gallon of rain water stir 1 oz. of sugar of lead, and 1 oz. of powdered lime until they are quite dissolved. Let the solution stand until the sediment falls, then pour off the clear water into another vessel, and let the sheet soak in this for twenty-four hours. This is a very good and simple one-season waterproofing, which is as useful for coats as for tarpaulins, but it cannot be regarded as permanent.

Another temporary expedient for rendering tarpaulins resistant to rain is a coating of grease, one part of mutton suet to two parts of beeswax, melted together and applied while liquid with a brush or a piece of rag.—"The Farmer and Settler."

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—_L. Matthewsii_ and _L. Earesiana_; the colours of both are lilac, but _Matthewsii_ is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape

vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earler days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thumbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine-coloured variety and the canary-yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing, when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September, 2.07, increasing gradually to a rainfall of 7.69 in. in February.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and khol-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Farm Notes for August.

LAND which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with sacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

THE bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches, with consequent over-production and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where is almost invariably makes it first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot, and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application of paradichlor, buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 feet

according to the size of the tree, will form the future head of the tree, and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertilizer, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertilizer or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The attention of citrus growers should be confined mainly to good varieties like Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour; also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lie about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-workng deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock.

SEED MAIZE FOR SALE.

All previous lists are cancelled

To growers desirous of obtaining a pure and reliable strain of improved seed, the following varieties are being offered and represent limited stocks raised from selected strains of Departmental seed:—

Yellow.—Funk's 90-Day; Reid's Yellow Dent; Star Leaming; Improved Yellow Dent; Golden Beauty.

CONDITIONS OF SALE.

Applications for seed, with accompanying remittance (exchange added), should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane. Postal address and name of railway station should be given, also date seed should be sent from Brisbane.

Advice will be sent when seed is despatched.

Purchasers are requested to write promptly after receipt of seed, should any matters require adjustment.

Should the variety asked for be out of stock, the Department may substitute another variety unless the applicant indicates a desire to the contrary.

Supplies of these stocks are limited, therefore applicants are advised to name a number of varieties in order of preference. Applicants will not be supplied with more than three bushels or with less than half a bushel of any one variety.

PRICES.

To enable applicants living at a distance to benefit, a flat rate of 9s. per bushel is being charged. This price includes all railage to the nearest railway station, but where steamer freight is necessary, this and any charges in relation thereto must be paid by the purchaser, and the cost thereof added to the remittance.

DESCRIPTION OF VARIETIES.

Funk's 90-Day.—Since the introduction of this variety to Queensland some years ago by the Department of Agriculture, a considerable amount of time has been devoted each year towards reducing the growing period and improving the type and yield. This is now a very popular variety, and is proving a good yielder, as well as being a good fodder corn. Yields of over 80 bushels per acre have been attained. At present it takes slightly over 100 days to mature. The ears are cylindrical in shape, and usually have sixteen to eighteen rows of very tightly packed grain. The grain is plump, of good depth, and slightly pointed; it has an amber-coloured base, with a rich yellow cap and a crease dent.

Reid's Yellow Dent.—Moderately tall growing, medium-early variety—four months. The ears are cylindrical in shape, of good size, usually carrying from sixteen to eighteen tightly packed rows of medium-sized, slightly pointed, wedge-shaped grain, which is of a golden colour, with dark amber base and slightly rough crease dent. The stalks are light and leafy. It is suitable for the production of early crops, or for districts where there is a short growing season. It is also a good fodder corn. Special strains of this seed have yielded over 100 bushels per acre under field conditions.

Star Leaming.—This is a fairly short-growing, medium-early variety, taking about four months to mature. Ears carry from sixteen to twenty rows of grain, are borne fairly low on the stem, and are weighty and very compact. The grain is of medium size and blunt-wedge shape; bright amber in colour, with a distinct yellow cap and a rough crease dent. It is one of the best of the early varieties; is very suitable for early or catch crops, a heavy yielder, and a very popular variety.

Improved Yellow Dent.—A tall-growing, late-maturing variety—five to five and a-half months. The ears are cylindrical in shape, carrying sixteen to eighteen tightly packed rows. The grain is deep, wedge-shaped, of rich amber colour, with a yellow tip cap and rough crease dent. It is suitable for coastal districts and scrub lands, where there is a good rainfall. It is capable of giving heavy yields of grain and fodder. Special strains of this seed have yielded over 100 bushels per acre under field conditions.

Golden Beauty.—This is a tall-growing, medium-late variety—four and a-half to five months. The ears are long, with very small core, and usually twelve rows of grain. The husk covering is good. The grain is flat, of medium depth, with slightly rounded shoulders; bright amber in colour, with cream-coloured cap and long crease dent. It has a very high shelling percentage, is a very hardy variety, and a splendid yielder. It is also a good fodder corn.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1932.		August, 1932.		MOONRISE. July, 1932.	MOONRISE. Aug., 1932.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.47	5.3	6.38	5.18	4.11	5.39
2	6.47	5.3	6.37	5.19	5.17	6.27
3	6.47	5.3	6.36	5.20	6.3	7.6
4	6.48	5.4	6.35	5.20	6.56	7.42
5	6.48	5.4	6.35	5.21	7.46	8.17
6	6.48	5.5	6.34	5.21	8.31	8.48
7	6.48	5.5	6.34	5.22	9.7	9.21
8	6.48	5.6	6.33	5.22	9.43	9.56
9	6.47	5.6	6.32	5.23	10.14	10.33
10	6.47	5.6	6.31	5.23	10.47	11.15
11	6.47	5.7	6.30	5.24	11.19	p.m. 12.10
12	6.47	5.7	6.29	5.24	11.55	1.9
13	6.46	5.8	6.28	5.25	p.m. 12.37	2.13
14	6.46	5.8	6.27	5.25	1.22	3.17
15	6.46	5.9	6.26	5.26	2.19	4.21
16	6.46	5.9	6.26	5.26	3.22	5.25
17	6.45	5.10	6.25	5.27	4.26	6.23
18	6.45	5.10	6.24	5.27	5.31	7.19
19	6.45	5.11	6.23	5.28	6.35	8.12
20	6.44	5.11	6.22	5.28	7.37	9.5
21	6.44	5.12	6.21	5.29	8.35	10.0
22	6.44	5.12	6.20	5.29	9.30	10.54
23	6.43	5.13	6.19	5.30	10.23	11.52
24	6.43	5.13	6.18	5.30	11.17	...
25	6.43	5.14	6.17	5.30	...	a.m. 12.45
26	6.42	5.14	6.16	5.31	a.m. 12.11	1.41
27	6.42	5.15	6.15	5.31	1.5	2.36
28	6.41	5.15	6.14	5.32	2.1	3.28
29	6.41	5.16	6.13	5.32	2.56	4.17
30	6.40	5.16	6.12	5.33	3.52	5.0
31	6.39	5.17	6.11	5.33	4.47	5.39

Phases of the Moon, Occultations, &c.

4 July	● New Moon	8 20 a.m.
11 ,,	☾ First Quarter	1 7 p.m.
18 ,,	○ Full Moon	7 6 a.m.
25 ,,	☽ Last Quarter	11 41 p.m.

Perigee, 14th July, at 8.48 a.m.
Apogee, 26th July, 12.54 p.m.

The Moon will pass Mars at 2 p.m. on the 1st, when the planet will be 5 degrees southward of it. Two days later, at 6 p.m., Venus will be passed by the Moon at a distance of 9 degrees.

On the 4th the Earth will be at its greatest distance from the Sun.

When the Moon rises, 21 minutes after sunset on the 18th, Saturn will be only about 3 degrees northward of it.

Mercury will be at its greatest distance, 27 degrees, east of the Sun, on the 20th, and will remain above the horizon 2 hours 5 minutes after sunset. The nearness of the two planets, Mercury and Jupiter (in the constellation Leo), will then be interesting, as they will be drawing nearer together till the 23rd and will be the principal objects in the western sky early in the evening.

Venus and Mars will be morning stars during the latter half of the month.

On the 24th Saturn will be in opposition to the Sun, rising as the Sun sets on that day.

On the 30th the Moon will pass about 5 degrees northward of Mars, about midday. At 7 p.m. the Moon will pass Venus at a distance of 11 degrees.

Mercury will set at 6.26 p.m. on the 1st, and at 7.10 p.m. on the 15th.

Venus will set 7 minutes before the Sun on the 1st; on the 15th it will rise at 5.1 a.m. and set at 3.38 p.m.

Mars will rise at 4.21 a.m. and set at 2.45 p.m. on the 1st. On the 15th it will rise at 4.11 a.m. and set at 2.30 p.m.

Jupiter will rise at 9.28 a.m. and set at 8.18 p.m. on the 1st; on the 15th it will rise at 8.43 a.m. and set at 7.36 p.m.

Saturn will rise at 6.50 p.m. and set at 8.23 p.m. on the 1st; on the 15th it will rise at 5.53 p.m. and set at 7.24 a.m.

The Southern Cross will be on the meridian, at its highest point, 57½ degrees above the horizon at Brisbane, but 4 degrees less at Rockhampton—at Cairns it will be only 46½ degrees high—at 6 p.m. on the 1st of July.

2 Aug.	● New Moon	7 41 p.m.
9 ,,	☾ First Quarter	5 40 p.m.
16 ,,	○ Full Moon	5 41 p.m.
24 ,,	☽ Last Quarter	5 21 p.m.

Perigee, 8th August, at 5.42 p.m.
Apogee, 23rd August, at 7.42 a.m.

The astronomical event of the month will be the grand total eclipse of the Sun on the 31st, visible, if weather conditions are favourable, at Montreal, Canada, and adjoining places, but unobservable in Queensland.

There will be an occultation of Spica by the Moon on the night of the 8th after they have set, but before 10 o'clock it will be interesting to notice the near approach of the Moon to the star.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Country Life—The Dignity of Labour.

ADDRESSING the undergraduates of the Queensland University recently, His Excellency the Governor, Sir Leslie Orme Wilson, laid great stress on the responsibilities of democracy and the dignity of labour. He said he had some personal knowledge of the University of Reading—the youngest university in England—and of the University of Bombay, of which he had been Chancellor. At Reading the undergraduates took little interest in politics beyond their connection with debating societies and political clubs, but at Bombay the students were politicians from the time they entered the university, and most of their actions were based on political ideals. It had been said that in Queensland there was a desire on the part of the undergraduates to become clerks or to go into the professions, because it was felt that they might lose status in society if they did not follow that line. That touched the whole question of democracy, particularly in a country like Queensland, where so much wealth came from the land. The truest democracy in the world was to be found in Great Britain, where democracy was defined as a form of representative government under which the people elected those who were to govern them on their behalf. Great Britain had built up its democracy steadily—it was not a mushroom growth of a night. The British Parliament was the mother of Parliaments—it had pursued its methods of procedure and its work in accordance with the progressive views of the British public. So democracy could only advance, in Tennyson's words, "by freedom slowly broadening down, from precedent to precedent." That was what was happening in England to-day. India was an older country that Britain—perhaps the oldest civilisation in the world—but India had been governed for many years under an autocracy. While every one was desirous of seeing India becoming a self-governing democracy, that could only be done by a gradual broadening down as in England.

There could be no democratic state in the world unless the dignity of labour was recognised. There could be no question of any one being looked down upon because he rolled up his sleeves and went to work. He took it that in Queensland anyone should be prepared to go out and work on the land and make something for himself and not use a pen in some office. Introducing a personal note, His Excellency said his own son had been apprenticed to the Hudson Bay Company and had farmed the land with a six-horse plough; he had since come to Australia, had gone on a training farm in New South Wales, and was now on a station learning his job.

The Sugar Agreement—Premier's Notable Speech.

"SO far as the Queensland Government is concerned, as one party to the contract, the Sugar Agreement will stand," declared **the Premier, Mr. W. Forgan Smith**, at the conference convened by the Commonwealth Government to consider the affairs of the sugar industry in Brisbane on 27th July. At the outset, he said that his Government had in no way, as a party to the agreement, been consulted in the summoning of the conference, or on the business that was to be placed before it. By virtue of the national character of the industry, and the White Australia policy, all Governments, both Commonwealth and State, had found it necessary to adopt a very definite policy towards the industry, and in consequence it could not be assumed to be in the same category as any other industry. There were particular features associated with it that were essential to the welfare and development of the Commonwealth.

After reviewing the findings of the Committee of Inquiry, which had recommended, among other things, the renewal of the embargo on imported sugar for five years, and the maintenance of the existing prices for three years. Mr. Forgan Smith said that the existing agreement also provided in those clauses relating to the constitution of "Trust Accounts" that when sufficient credits had accrued therein such savings should be passed on to the Australian consumers. So far as the average price per ton for raw sugar was concerned, the average of the years 1927, 1928, and 1929 was £21 1s. 4d. per ton, but during last season, 1931, the average price was £18 6s. per ton. The export surplus was not a small factor in maintaining the Commonwealth's favourable trade balance overseas.

The Premier emphasised the volume of interstate imports into Queensland, stating that for the twelve months ended 31st December, 1931, these totalled £11,332,617 (excluding stock and wool overland). Exports to other States from Queensland for the same period totalled £9,986,165, of which the value of sugar was £6,144,610 (excluding stock and wool overland). It would be seen that about one-quarter of the purchases were due to sugar, and that without sugar the trade would be very unbalanced. "It must be borne in mind," said Mr. Smith, "that the throwing out of one worker, for instance, in the sugar industry, by reducing export, would carry in its train the throwing out of possibly two others as a corollary."

Mr. Smith referred to the special monetary grants to other States, and said that, in addition, they must take into consideration the bounty on wines, dried fruits, wheat, and specially protected tariff advantages to manufacturing industries in the South. "Queensland citizens accept their quota of obligation in such matters without complaint," said the Premier.

The restoration of parity between costs and prices was being generally recognised as a matter of urgency and as part of any scheme of reconstruction in industry, and the increase in the price levels was the only means through which trade recovery could take place. That elementary principle was being recognised at Ottawa. "It seems to me extraordinary," pursued Mr. Smith, "that whereas the Ottawa Conference is considering the raising of price levels, we should be having a conference here at which we are asked to reduce price levels." If this contract was to be reviewed in the manner suggested, it would, without doubt, seriously affect the revenue. It would affect the volume of employment, and it would affect the purchasing power of those engaged in the industries of Queensland. The Queensland Government had honoured the agreement executed between the two Governments, and the Moore Government had already issued the proclamation acquiring the 1932 crop under the conditions laid down in that agreement. Costs had already been incurred in connection with the ensuing crop now being harvested, and bank advances had been made on the basis of the agreement referred to. "Having regard, therefore, to all the circumstances," said the Premier in conclusion, "my Government takes the view that the agreement which was entered into after complete and exhaustive inquiry should be honoured by both Governments in its entirety, and that the conditions of the industry should not be in any way disturbed."

Science and the Grazing Industry.

SPEAKING at the formal handing over of the new research laboratory at the Brisbane Abattoir, the Minister for Agriculture and Stock said that the Council of Scientific and Industrial Research had his sympathetic support in their efforts to solve some of the problems of rural industry. He was not insensible to the responsibilities that had been placed on the Government by the establishment of the laboratory, in which the problems of the men in the West and in the North would be solved. What would become of vast areas in the North and West if the cattle and sheep industries failed? The problems of this and other industries were becoming greater and more pressing as time went on. It had been a statesmanlike thought which had prompted the establishment of the Council of Scientific and Industrial Research, and it was a matter of wonder that there were not more liberal contributions to the cost of its work. The old days of haphazard effort were gone, and the period of scientific research was upon us. There were problems enough and to spare to be tackled. We had wondered long enough about these problems of export meat, and this was the first consistent effort made to determine why we were not capturing all the trade we should. If the laboratory achieved a solution of that, and that alone, it would have justified its establishment.

Mr. Bulcock went on to praise the work being done in the laboratory in North Queensland, and said that the Council of Scientific and Industrial Research had a great and definite mission. The influence of this new laboratory would radiate to the smallest cattle-owner in the West. The utmost resources of his department, he promised, would be at the disposal of the Council in the legitimate prosecution of its great work. He thought that there ought to be more co-operation between his department and the Council, and it was with that object in view that he had asked Professor Richards to become chairman of the committee controlling the new experimental station at Yeerongpilly. That new station dealt with another all-important phase of the meat industry; for it aimed at the raising of healthy cattle.

THE HON. FRANK W. BULCOCK.

MINISTER FOR AGRICULTURE AND STOCK.

THE Hon. Frank W. Bulcock, Minister for Agriculture and Stock in the new Queensland Government, has had a lifelong association with rural industry and its problems. He was born at Mount Arapilis, Victoria, where his parents farmed successfully an irrigation area. His early education was obtained at the Newtown Superior Public School, Sydney. Completing his primary tuition, he entered the Sydney Technical College as a student, where he took the agricultural course and graduated with first class honours. Veterinary science next claimed his attention, and afterwards he succeeded in winning an agricultural bursary, of which only nine were then available annually in New South Wales. He selected the Wagga Agricultural College and Experimental Farm for further training in agriculture and animal husbandry, and there won added distinction as a student, achieving in his term the position of dux of the College and taking honours in bacteriology, plant diseases, dairy practice, and sheep and wool. In the semi-final examinations he obtained the remarkable average of 91 per cent. in agricultural science, and later secured an excellent pass in veterinary science. On leaving Wagga he devoted his attention to plant breeding with a special bias towards wheat, working on different farms in the Riverina with the object of gaining further field experience. Plant breeding has continued an absorbing interest with Mr. Bulcock, notwithstanding the demands of a strenuous parliamentary career.

Coming to Queensland he quickly found an outlet for his energies in the pastoral industry. Like many other young Australians who have made their mark in public life, he was impatient with the social inequalities of the day. Joining the Australian Workers' Union, perhaps the greatest of our industrial organisations, he soon became prominent in its councils, and, winning the confidence of its members, was elected to an important official position. The Union movement, wisely governed, provides an excellent training in the qualities needed in public life, and to Mr. Bulcock the years spent in active association with the A.W.U.--an organisation of competent direction, high standing, essentially all Australian in its outlook, and unweighted with narrow provincial or sectional prejudice—were invaluable. He was thus brought into direct and vigorous contact with men and affairs, and that experience has helped him immensely in his career as a representative of the people.

When the Barcoo seat in the State House became vacant on the entry of the late Hon. T. J. Ryan, a former Premier of Queensland, into the Commonwealth Parliament in 1919, Mr. Bulcock was selected for the ensuing contest, which he won with a substantial majority. At the general election of 1920 he retained the seat without difficulty, and at the four subsequent triennial appeals to the people he was accorded the distinction, like his predecessor in office, Mr. Harry F. Walker, of being returned unopposed.

In the course of his parliamentary career Mr. Bulcock has made a special study of agricultural and land laws, and rural economy generally. As chairman of the Parliamentary Agricultural Committee in successive Parliaments, he has had a shaping hand in legislation designed to make the farmer corporately articulate, and to give him a firmer control of the disposal of his products and a fairer share of the profits of his industry. Conditions at the time called for a fresh, broad survey of country life and its problems, a greater appreciation of the difficulties that beset Queensland's basic industry, and a more definite sense of direction in respect to its fullest development, economically and otherwise. It was then becoming more widely recognised that the fostering of the agricultural industry, on which present prosperity is based and our future must be built, demanded the attention of the best minds of the Commonwealth, and to that end farmers themselves must be given an opportunity of contributing their quota of brains and energy. The field of rural organisation was cleared and widened, new furrows opened, the machinery delivered on the ground, and into the hands of the farmers of Queensland was placed their own industrial destiny. In all that legislative planning a sound practical knowledge of agriculture and its economic and other problems, in all their complexity and perplexity, was a recognised essential. Mr. Bulcock's share in it was of no small measure. He remains convinced that the prosperity of Queensland depends on a vigorous land settlement and a sound agricultural programme.

As a debater Mr. Bulcock has earned a deservedly high reputation in the House. Obviously an earnest student of public questions, he has a happy knack of classifying and marshalling his facts and arguments in orderly sequence and presenting them clearly, logically, and convincingly, and with a natural courtesy that takes all the sting out of any antagonism that might be aroused in the minds of those championing opposing schools of thought. "Hansard" records show that many notable contributions

PLATE 30.
HON. FRANK W. BULCOCK, MINISTER FOR AGRICULTURE AND STOCK.

PLATE 31.

HON. HARRY F. WALKER, formerly Minister for Agriculture and Stock, and representative of Cooroora in the Legislative Assembly.

to discussion on rural economics and related subjects have been made by Mr. Bulcock, and that his speeches in Parliament are marked by the rather unusual quality of reading well even long after the favourable impression produced at their hearing—the pleasant influence of the well-spoken word—has been effaced. His rare appeals to sentiment have been based always on the Australian doctrine of a fair deal and the decent thing in all human relationships. Like most Western men, he is an apostle of the constructive idea, a fighter for true national ideals, yet with eyes wide open to realities.

Mr. Bulcock's home is at Corinda. He is chairman of the local State School Committee, and a member of the executive of the Queensland Ambulance Transport Brigade. Reading, tennis, fishing, and experimental work—chiefly with pecan and Australian nuts and the tung oil tree—occupy his hours of limited leisure.

VALEDICTORY.

RETIREMENT OF THE HON. HARRY F. WALKER.

ON the occasion of his relinquishing the office of Minister for Agriculture and Stock, which he had held with distinction for three years, Mr. Harry F. Walker invited the whole of the headquarters staff of the Department to meet him for the purpose of bidding them farewell and of introducing his successor, Mr. Frank W. Bulcock.

In the course of a brief valedictory address Mr. Walker paid a generous tribute to his former officers for their capable and loyal service during the term of his occupancy of the ministerial chair. He assured them of a continuance of a personal interest in their welfare and in their official activities. He, like his predecessor, Mr. Forgan Smith, had always regarded the Department of Agriculture and Stock as the most important in the State, and believed that his successor, Mr. Bulcock, held the same view. He had always observed a spirit of healthy co-operation among his officers with the people on the land, a spirit which he had done his best to foster and which he knew would continue under Mr. Bulcock's guidance.

The scientific and technical branches had for him an especial interest, and he felt a pride in his association with them, as well as with the work of the administrative staff, which had established a very high standard of efficient public service.

In introducing his successor, Mr. Bulcock, Mr. Walker referred feelingly to the personal friendship that existed between them, and congratulated him most heartily on his accession to office.

Mr. Bulcock replied briefly, and in the course of happily phrased remarks expressed pleasure at meeting the officers of the Department, paid a warm tribute to his predecessor's fine personal qualities, and congratulated him on the success he had achieved in office, which he hoped, with the co-operation of all concerned, to emulate.

At the request of those assembled, Mr. Bulcock presented Mr. Walker with several gifts, including one for Mrs. Walker, as tangible evidence of their appreciation of him as their chief and also as a man; as well as an expression of a desire for him to have in his home at Tewantin some little reminder of his long association with the Department and its officers. To the presentations were added sincere wishes for a long life of health and happiness for both Mr. and Mrs. Walker.

Further valedictory speeches, expressing the personal sentiments of all present, were made by Messrs. E. Graham (Under Secretary), H. T. Easterby (Director of the Bureau of Sugar Experiment Stations), and H. C. Quodling (General Manager of the Agricultural Bank).

Mr. Walker then thanked each officer individually for services rendered to the Department during the term of his control. While Minister for Agriculture and Stock Mr. Walker was responsible for the following measures, all of which have had a beneficial influence on country life and industry and the general welfare of the people of Queensland:—The Banana Industry Protection Act; Native Plants Protection Act; Soil Survey Act; and amendments of the Primary Producers' Organisation and Marketing Act, Wheat Pool Act, Fruit Marketing Organisation Act, Agricultural Bank Act, Diseases in Stock Act, Diseases in Plants Act, and Margarine Act.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XXVIII—continued.

Farm Machinery—(B) Cane Harvesters—continued.

IN recent years the idea of cutting cane by machinery has been more strongly developed, and an earnest effort has been made to solve the problem. It is now more probable that this important invention may be satisfactorily realised.

The Falkiner Cane Harvester.

As mentioned in the preceding article, the basis of this machine was the Hurrey Harvester, invented and built many years ago, and which was demonstrated first about 1910, and then at intervals, the last being at Sarina under the auspices of the Australian Sugar Producers' Association in August, 1921. Mr. Hurrey, I understand, was an old canegrower himself, but apparently he did not possess sufficient capital to fully develop the machine.

Mr. R. S. Falkiner, a Victorian, primarily associated with pastoral interests in Australia, became interested in the Hurrey machine, and saw in it the germ which his personal mechanical skill and his command of money would enable him to develop. He, with an engineer, Mr. W. G. Charley, set about improving the machine, and in 1924 the Falkiner Cane Harvester was first tried out at Qunaba Plantation. A report from the Sugar Experiment Station, Bundaberg, in September, 1924, stated:—

> "The principle of working is altogether new and entirely different from any previous machine, the knives operating in front do very good work, cutting level with the ground or slightly under, if required. Before coming to the knife the cane is gathered by two long arms, is cut and carried by an endless chain with fingers attached onto an elevator or carrier, top first, the top is then caught between two pneumatic rollers, and the stick passing through these at a great speed is thrown to the back of the machine, about 6 feet. The top then striking a board forcibly drops on two revolving knives, is removed and ejected, while the stick falls on two other pneumatic rollers and is dropped into a hopper at the bottom.
>
> "With regard to the work of the machine, there are various improvements required before it will really be a commercial success. The topping of cane having tops of different lengths is one big difficulty, and arrowed cane presents another.
>
> "The machine is not designed at present to cut green or tangled cane.
>
> "When seen at work the Harvester was working in a 12-ton per acre crop, and was cutting at the rate of 6 tons per hour, but with more power it could easily double that."

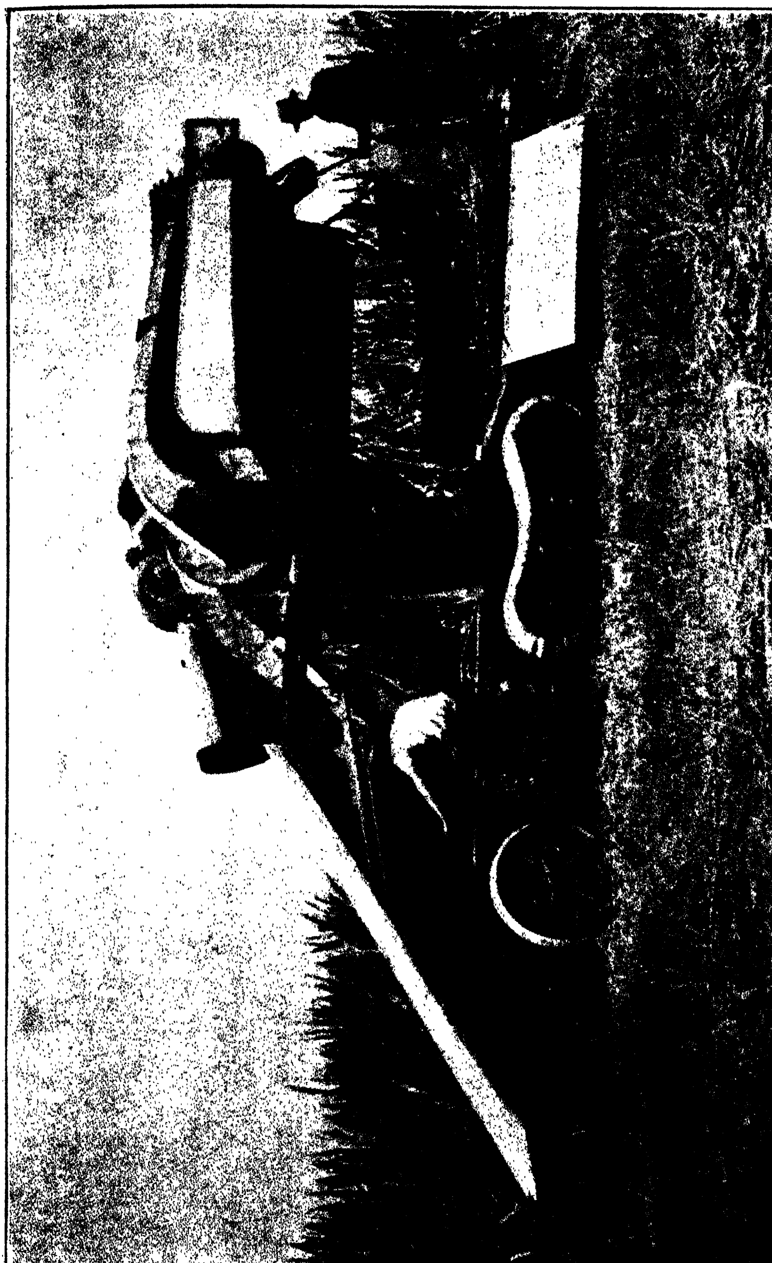

Plate 32.—The Falkiner Cane Harvester (Queensland Model) in 1925.

In the year 1925 the machine was again tried at Bundaberg. When the writer saw it the harvester was operating in a small crop of burnt straight-standing cane. At that time it was being inspected by many well-known sugar men, and the general impression was that as far as operating in burnt straight cane was concerned the work of cutting was well done.

The following description of the machine as it then was, appeared in the press:—

> "Its motive power was derived from two 20-h.p. Austin engines using kerosene, their fuel consumption being half-a-pint per horse power per hour, or, in other words, 2½ gallons per hour for both engines. The caterpillar type of traction was decided upon by the inventor, but the regular style was found to be useless, inasmuch as when turning at the end of the row the square edges of the plate were found to tear up the stools of cane. To obviate this was a necessity, and was responsible for the introduction of an ingenious system of snake-scale bevelled-edge overlapping treads designed by Mr. Falkiner. The knives cut the cane at any desired depth beneath the ground surface, being raised or lowered at the will of the operators. The knives were almost oblong in shape, their dimensions being about 18 inches by 7 inches, sharpened at the short ends only. each working on its own shaft with an outward motion overlapping about 1 inch; and no trouble was experienced from stones up to 6 inches in diameter as they were thrown outwards. The cane was drawn into the mouth of the harvester by a revolving chain rake, being then cut by the knives referred to and carried up the elevator between two pneumatic rollers. These rollers were inflated, and revolved at such a very high rate of speed that each stalk of cane was projected after the manner of a spear being thrown towards the baffle plate. Immediately after the cane left the pneumatic rollers it was lifted up by a 12-h.p. power air blast obtained from a blower fan through a pipe to four jets. This powerful blast forced the cane up against inflated rollers which also revolved at a very high rate of speed, stripping the burnt cane of the majority of the trash attached to it.
>
> "The top of the cane, still travelling fast, was forced against the baffle plate with sufficient force to bend back all the leafy tops and permit the two revolving knives to cut off the top of the stalk at the correct point, irrespective of whether the cane were 2 feet or 14 feet in length. The tops were thus cut very uniformly. The severed top was dropped behind the machine, and the cane fell into a carrier which enabled bundles of any desired size to be dropped systematically, thereby facilitating loading. The cut cane could also be dropped into a truck running alongside the machine."

From the experiences gained in the preliminary trials at Bundaberg further alterations and improvements were made, and in the 1926 season the machine was taken North and operated in heavier Badila crops. This disclosed other weaknesses, and it was recognised that there were still many difficulties to surmount.

Later in the same year the harvester was tried at the Palms Estate, Mackay, but it again developed various faults. The topping was not

satisfactory. When the machine was tried in green cane it became choked after going about 20 feet. Objections were registered as to its size, it requiring about a 30-feet headland in which to turn.

In the 1927 season the machine was again tested. It was reported that the ground cutting was good in level patches, but only fair in uneven places. The paddock it was tried in at Te Kowai, Mackay, was rather broken and the soil lumpy. The topping done was described as only medium. The trial was marked by much mechanical trouble.

A company known as the Queensland Cane Harvesting Corporation, Limited, was formed to control the Australian rights of this machine in December, 1925. The directors comprised a number of well-known men in the industry, and many of the mills (more particularly in North Queensland, took shares. Mr. R. Muir (now on the staff of the Queensland Cane Growers' Council) who was at that time associated with the above company informs me that the number of machines made in Australia totalled six. Five of them were made in Queensland by Messrs. Evans, Deakin, and Company, and one was manufactured in Melbourne by the company itself.

Demonstrations ceased in Australia about November, 1927, and about that time it became generally understood that the Falkiner machine would be taken to Cuba to be developed. For some time after this date little was heard of it. In 1930, however, a cablegram appeared in the Brisbane "Courier" that Mr. Falkiner had sold a half interest in the harvester to the Punta Alegre Sugar Company, of America, and that the Dahlberg Company, of America, had taken an exclusive license for the harvester covering the American Continent. It was subsequently stated in March of 1931 that, with the help of American engineers, minor defects had been eliminated, and that a much lighter and considerably less expensive model had been evolved. An American company had been formed for its manufacture, and a Cuban order had been placed for about twenty of the machines. The machine was tested in Florida in March, 1931, and the following account of its operations was given in the American Sugar Journal, "Facts about Sugar":—

> "For the first time in the history of the sugar industry a cane crop is being taken off this season by the use of mechanical harvesters. This epoch-making proceeding is taking place at Clewiston, Florida, where the Southern Sugar Company, up to the middle of February, had harvested over 20,000 tons by mechanical means under conditions of unusual difficulty resulting from the tangled state of the cane and the softness of the ground in consequence of heavy and protracted rains.
>
> "The machine that is performing this work is the Falkiner cane harvester, which has been twenty years in process of development. It originated in Australia, and was improved as the results of field tests in Cuba and Florida.
>
> "The man responsible for the practical realisation of the long-cherished dream of a mechanical cane harvester is Ralph S. Falkiner, an Australian, who, curiously enough, never has been directly engaged in the sugar industry. His attention was directed to the possibility of applying power to the task of cane cutting by a Queensland canegrower who had been experimenting with the problem. Mr. Falkiner extended financial

support to the originator of the idea, and after the death of the latter continued the work of development, subsequently associating with himself a capable mechanical expert, W. G. Charley.

"Up to 1929 one of the most obstinate difficulties encountered by the builders of harvesting machines was that of topping the cane at exactly the right point. In the 1930 model of the Falkiner harvester this problem was eliminated by incorporating a device for cutting the entire stalk into short lengths and passing these through a cylindrical chamber from which a strong current of air carries off the light material, including leaves, tops, and trash, and spreads it over the ground from which the cane has been cut, while the sections of the cut-up stalks are conveyed by an elevator to a truck or tractor-driven cart travelling alongside the harvester.

"Another departure from earlier practice in designing the recent models of the harvester is the equipment of the machine with a broad fender which pushes the standing cane forward to an angle of about 45 degrees before the stalk is severed, at or slightly below the surface, by revolving disc knives. The butts of the stalks are seized by the revolving fingers of the conveying elevators and are drawn into the machine. In this way canes that lie flat upon the ground, as well as crooked or curving stalks, are cut as efficiently as those that stand upright. Two circular discs placed vertically on the outer sides of the fender cut any canes that lie horizontally across the rows, and the portions of these stalks left behind on one trip across the field are taken up on the next trip.

"The double elevators gather the cane and trash and pass it along to chopping knives which cut the mass into sections 4 to 6 inches in length. These are carried to the separating drum where the trash is winnowed out. What Mr. Falkiner describes as the 'push-over' method of cutting the cane and taking it into the machine, and the system of separating the trash from the stalks by a strong air current are the two most important innovations in transforming the harvester from a hopeful experiment to a commercially practical machine.

"The 1930 model of the harvester was tried out in Cuba and later in Florida during the past season's harvest, and its performance was so satisfactory that orders for fourteen machines were placed by the Southern Sugar Company, while six others were ordered for shipment to Cuba. These machines were built by the Allis-Chambers Manufacturing Company at Milwaukee, U.S.A."

Later, namely, in February, 1932, "The Cuba Review" stated:—

"During last season the cost of hand labour was exceedingly low, and there is a probability that wages will be as low or lower during the coming harvest. On the basis of such wages it is said that the harvester cannot be operated economically, but as conditions improve and the price of labour rises from the abnormally low levels which prevail to-day, the harvester can undoubtedly be used at a considerable saving in the cost of producing sugar. In any event, opinions have been expressed that within a relatively short time the harvester will come into more general use throughout Cuba."

Plate 33.—The Falkiner Cane Harvester, Latest Model, now Working in Florida.

The Australian company has, I understand, no interest in the American rights. Further information regarding this harvester will be available later on, after the next annual meeting of the Australian company.

The Falkiner Company were rather unlucky, inasmuch as one machine was destroyed by fire in Queensland and another was washed overboard into the sea and lost somewhere off the coast of America.

Mr. A. F. Bell, the Pathologist to the Bureau of Sugar Experiment Stations, who was recently on the other side of the world as a delegate to the International Society of Sugar Cane Technologists, stated on his return to Australia:—

> "The Falkiner cane harvester is operating in Florida, but reports as to its efficiency were not altogether favourable. In order to facilitate the removal of the trash by means of a forced blast of air, the cane was being cut up into lengths of about 1 foot or less, and a considerable amount of cane was blown out also. One delegate reported that he had made an estimate of the amount of cane lost in this manner, and computed it to be in the region of 10 per cent."

In a report mentioned in the proceedings of the fifty-first annual meeting of the Hawaiian Sugar Planters' Association, Mr. J. Meineeks stated that three machines in Cuba had not been uncrated, due to the fact that the Cuban Government threatened to tax each machine 100,000 dollars.

Miller-Owen Cane Harvester.

This machine was invented in Mackay about the year 1926, and was practically financed by a Mackay company formed about 1927. It was on a much lighter and compact basis than the Falkiner harvester, and it was hoped that as it would cut from 5 to 10 tons per hour it would be particularly suitable for each farmer with a moderate crop to purchase one of his own. The estimated working costs were given in the prospectus as follows:—

	Based on 5 tons per hour.		Based on 10 tons per hour.	
	s.	*d.*	*s.*	*d.*
Operator per ton	0	6	0	3
Oil and fuel	0	3	0	3
Maintenance	0	2	0	2
Loading	1	6	1	6
Machine and other charges	2	0	2	0
	4	5	4	2

The dimensions of the harvester were given as—Length 15 feet, height 7 feet 9 inches, width 9 feet 6 inches, three-wheel suspension, two-wheel drive, and in transportation the machine could be moved from point to point under its own power. The cane stools were cut on top of the root system, the cutting knives (which were of the revolving type) severing the cane clean and levelling the soil and sealing the cut stool. The cane was to be topped by a simple method and the cane deposited in a carrier which automatically emptied, leaving the cane in bundles as desired ready for loading. A picture of this harvester is given below.

Plate 34.—Miller-Owen Cane Harvester.

The Harvester in Operation.

During the past four or five years demonstrations have been given of the working of this machine, and it developed a good deal of promise towards solving the problems. Numerous improvements have been introduced from time to time to give greater strength and efficiency.

Further experiments with this machine are at the time of writing held up for want of funds, and the company has been wound-up compulsorily.

The Howard Cane Harvester.

This machine has also been introduced during the past few years, and was designed by Mr. A. C. Howard, and manufactured by the Austral Auto Cultivator Company, of Northmead, Sydney. It was reported to cut at a faster rate than the Miller-Owen machine mentioned above.

The following is an early description of this harvester:—

> "The harvester consists of a cutting apparatus situated on the side of the tractor and extending forward to about opposite the front wheels. A chain conveyor connects the cutting apparatus with a roller table situated immediately behind the rear wheels of the tractor.
>
> "The standing cane is cut by two revolving discs. The butts of the cane are then gripped firmly between two serrated-edged conveyor chains and carried rearwardly at a fast speed to a roller table. This pulls the cane down to a horizontal position ready to enter between the rollers.
>
> "The roller table consists of three sets of spiral-fluted rollers. The first set of rollers receive the cane from the conveyor and carry it rearwardly until the heads clear the first set of rollers and at the same time it is carried crosswise by the spiral flutes on the rollers and passed on to the second set of rollers. These revolve in a forward direction, and the front bottom rollers are slightly higher than the others. These rollers carry the cane forward until the heads pass over the front roller to where it joins the cane. The cane being too stiff to bend up over the roller forms a short kink at the end of the cane; this holds the cane from going forward. It stays in this position till it is carried crosswise by the spiral flutes on the rollers and comes in contact with a rotary knife which cuts the heads off. The cane then passes on to a third set of rollers which carry it rearwardly, passing between two rotary brushes designed to take off the leaves and scale from the cane. It then passes out of the back of the machine into a trailer or a dumping rack, as required.
>
> "The tops and leaves are conveyed to a chaff-cutting apparatus situated on the machine and cut into short lengths so that it can be easily worked into the ground for green manure.
>
> "A blower is placed on the side of the machine which directs a blast of air to a point near the topping knife, and which blows trash and dirt clear of the hopper."

It has been stated that the harvester travels at the rate of ¾ of a mile per hour, and cuts 9 tons per hour.

According to a report made to the Bureau of Sugar Experiment Stations in 1931 this harvester cut burnt small cane averaging about 12

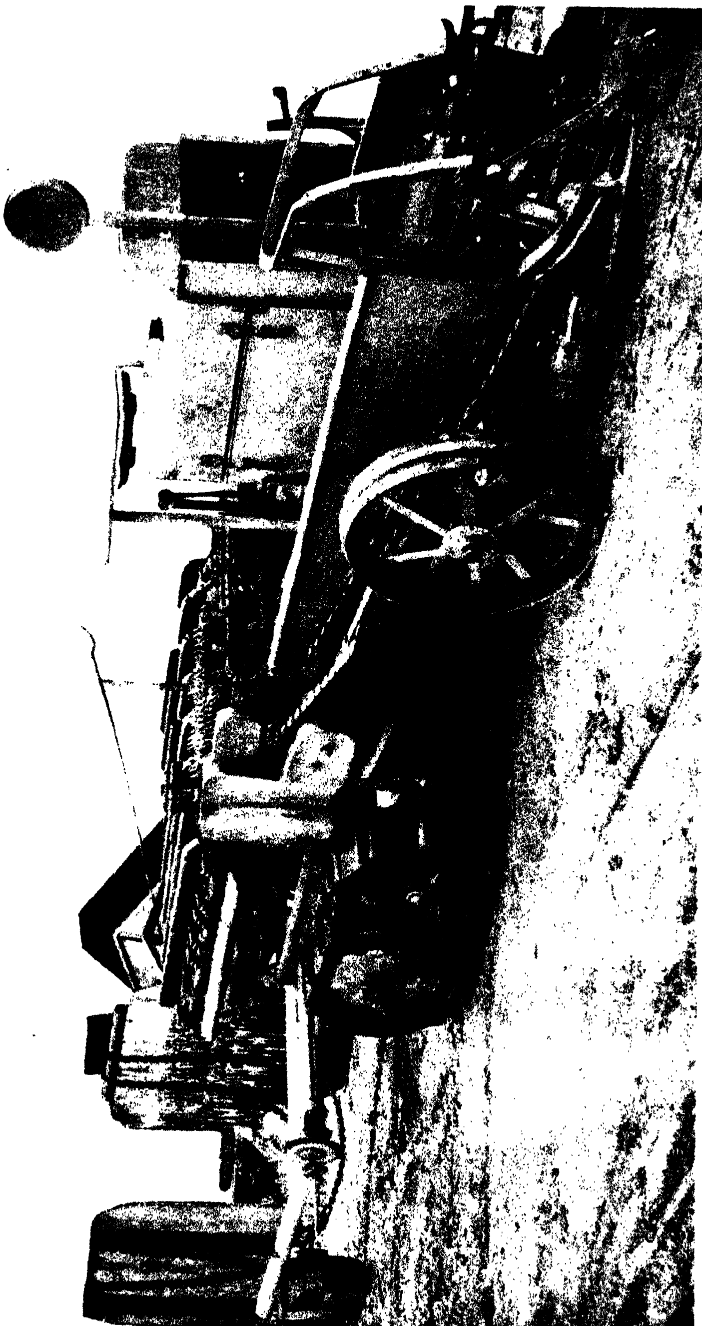

PLATE 35.—HOWARD CANE HARVESTER.

PLATE 36.—HOWARD CANE HARVESTER WITH LOADER ATTACHED.

tons per acre at a calculated rate of 5·7 tons per hour, and burnt cane of approximately 20 tons per acre at the calculated rate of 8 tons per hour. Taking into consideration the time of discharging the load, it took forty minutes to cut and discharge a load of 25 cwt. in the small cane, which equalled a rate of 37 cwt. per hour, or, if stoppages due to a minor breakdown be deducted, the capacity would have been at the rate of 43 cwt. per hour. In the larger cane the machine could handle from 3 to 4 tons per hour cutting and discharging. The handling and discharging of the cane from the truck as well as preparations for the next load, occupied a considerable amount of time.

This machine is expected to be working at Fairymead Plantation during the present season, with a view to its further development.

The illustrations, for which I am indebted to the "Australian Sugar Journal," give some idea of this machine.

Summary.

Although all of the machines mentioned in this chapter are of promise, the problem of satisfactorily harvesting cane by machines has not yet been solved.

[TO BE CONTINUED.]

SOILS AND SUGAR CANE CULTURE—II.

CONSERVATION OF MOISTURE.

By H. W. KERR.*

LAST issue we discussed the mode of soil formation, and the nature of the plant food materials or nutrients which are absorbed from the soil through the plant roots. It will also be remembered that the process of food manufacture by the crop leaves was described; water from the soil and carbonic acid gas from the atmosphere were stated as the raw materials from which the sugars and more complex foods were built up, and in this process the soil nutrients played a most important part. Now the supply of nutrients in the soil may be available in such limited amounts as to restrict the growth rate of the crop, but in that event the ready means of supplying this deficiency are at our disposal in the form of artificial manures.

We have no control over the carbonic acid supply of the atmosphere, and indeed this is one factor which need give us no concern; but the remaining raw material utilised in our factory—water—is one, to the supply of which we must give our vary careful consideration. It is very evident to every farmer in Queensland how frequently the water supply of the crop is the factor most seriously limiting crop production. Except for those fortunate growers who have at their disposal an adequate supply of irrigation water to supplement the natural rainfall, the farmer is entirely at the mercy of the weather for his supply.

Water is the life-blood of the plant, and its importance as a raw product for food manufacture is but one of the many functions which it performs in our crop economy. If we had appropriate means for studying a growing plant, we would discover the very interesting fact that a vigorous stream of water carrying the dissolved soil nutrients is being continuously drawn in by the numerous fine roots, passing upwards through the water-conducting vessels of the stem, thence, firstly, into the main veins of the leaves, and finally through the finer network into the sugar-manufacturing cells. From these cells the water is passed out in the form of vapour through those same minute pores in the leaf surface which allow of the free entry of the carbonic acid gas of the atmosphere.

The quantity of water used in this way is not generally appreciated. Careful experimentation has shown that in the production of every ton of cane over 160 tons of water are pumped through the plant and evaporated from the cane leaf surfaces. In the growth of a 30-ton crop, then, practically 5,000 tons of water are demanded from each acre of soil. Expressed in terms of rainfall, we find that 50 acre inches of water must be made available to the crop for the purpose; or, again, each stool of cane must have access to almost 200 gallons of water during its growing period.

It must be clearly understood that to produce our 30-ton crop this quantity of water must actually be absorbed from the soil by the crop; and the relationship between this quantity and that which falls on the land surface as rain varies widely. In almost all of our cane areas the

* In a series of radio lectures by Dr. Kerr from 4QG.

average rainfall is well in excess of 50 inches a year; but it is well known that in times of heavy downfalls a greater or lesser proportion of the water drains from the land surface, and when run off in this way is obviously incapable of crop production. Then rainfall distribution is erratic, even in those cane areas most favourably served in this respect. For instance, in the Babinda-Innisfail-Tully districts, where the average annual rainfall is round about 150 inches, long spells of weather are experienced in which vigorous crop growth is suspended, due to moisture deficiency in the soil. The question of the absorption of the maximum volume of water by our soils, and its retention for use by the crop during rainless spells, is one of the greatest questions confronting the Queensland agriculturist, and we will study in some detail the factors underlying the problem.

If we wish to store water, we must provide ourselves with a reservoir. The soil itself is the obvious natural storage reservoir for the farmer; and a study of the factors involved in the ready absorption of rainfall and the conservation of the stored moisture gives us a clear understanding of the true functions of all tillage and cultivation operations which are so essential to successful crop growth.

The farmer, in ploughing and harrowing his land, aims at reducing the compacted soil to a good, mellow bed, in which conditions are most favourable for the germination of his seed. This requires a moist, warm, well-aerated yet firm soil, in which the young roots will develop freely, and where the helpful little microbes are able to do, without hindrance, their job of helping to provide for the plant-food needs of the crop. These are also the conditions which favour the most ready absorption of rain which is received by the land; and the production and maintenance of these conditions is of paramount importance if the farmer would take full advantage of all that is possible in this regard. We must also keep in mind another factor in water conservation, and that is the capacity of our reservoir. Under the most favourable circumstances, 12 inches of loamy soil will hold only 3 to 4 inches of water. If a quantity in excess of this is received in one fall, the capacity of the soil to hold the added supply obviously depends on the nature of the subsoil stratum. If this consists of a tight clay, which has probably been further consolidated and compacted under plough action with tractor or horses, the rate at which it will absorb moisture is very slow, and the chances are that much of the valuable rain in excess of 3 or 4 inches will be lost by surface run-off. It is therefore imperative that a careful examination of the soil be made to a depth of 2 or 3 feet, in order that a cultivation system may be devised which will be most suitable to the particular conditions. At all times the cultural methods employed should aim at preventing the re-formation of these so-called "pans." The continued working of even light cultural implements to a uniform depth makes for the creation of hard pans; and the secret of successful tillage lies in varying the depth of cultivation, in order that the work of any implement will eliminate successfully any harmful residual effects of the preceding one.

We may conclude, then, that large quantities of moisture may be stored only when methods of deep cultivation are practised. That does not mean ploughing to excessive depths; in fact, many a farmer has discovered to his sorrow the harmful effects of bringing up too much raw subsoil at one ploughing; for this material might completely ruin the tilth of the surface soil, due to its high clay content, besides adding

a mass of material deficient in humus and plant food. The correct thing to do is to break up the hard-pan layer, without bringing any of the subsoil to the surface. This can be effected most successfully by the use of the subsoiler. The essential features of such an implement are a long blade coulter, terminating in a narrow chisel-shaped point or piercer. This implement does not entirely crumble the compact subsoil, but it does cut a narrow gash into which water and air can freely enter. Later, the crop roots follow down after the moisture supply, and, working around and through the cake, will ultimately disintegrate the most compact hardpan, making the entire mass mellow and friable.

The correct time at which to carry out this operation is when ploughing is in progress. With a second team, to follow in the furrow behind the plough, the subsoiler may be put down 6 inches below plough depth, and in this way the soil is brought into an open, absorptive condition to a depth of from 14 to 16 inches. The season at which the work is carried out is also important; for if moisture conservation is our ultimate object the job should be finished in advance of the wet season. November or December ploughing is most valuable in our sugar areas, and where a crop of green manure is to be grown the improved conditions effected by the deep cultivation will favour this cover crop as well.

It is not sufficient to provide only for the absorption of moisture, but we must guard the stored supply against loss through other channels than crop growth. A moist soil continually evaporates water from its surface, and if this process were allowed to go on unchecked much of our good work would be nullified. The growth of weeds and grasses on our ploughed land also dissipates the moisture required by our economic crop, and they must be eliminated as soon as they appear. The operation of surface cultivation implements is effective in overcoming these evils, and the value of a mulch of dry surface soil so produced is well appreciated in its influence on the conservation of soil moisture. Following every rain, therefore, light scarifiers or harrows should be brought into operation, when the surface soil is in suitable condition, and the surface mulch again restored.

Many of the soils of our tropical coast do not, unfortunately, give permanent response to cultural operations. When an effort is made to reduce them to a condition of good tilth much difficulty is experienced, and persistent and excessive working on the part of the farmer results in the production of a loose, dry mass, which can scarcely be considered as a favourable seed-bed. With the first heavy rains this dusty mass runs together, and on drying becomes a hard, impervious, concrete-like cake. The correction of this difficulty, which is an inherent property of the soil in most respects, is one which can be effected only with considerable effort. The most reliable and satisfactory method is to increase the humus content of the soil. In fact, it is with respect to its favourable influence on the physical condition of the land that a good humus supply is so desirable. In addition, it gives the soil the capacity to retain large quantities of water, by virtue of the fact that one part of humus might hold twice its weight of water, while soil minerals possess a retentive capacity of only about one-sixth this value.

At first sight, the problem of maintaining the humus supply in the soil might appear quite simple; a heavy mass of green manure ploughed into the land should undoubtedly result in a marked increase in the content of soil organic matter. As a matter of fact, the ploughing under

of even a very heavy crop of beans or peas results in the gain of a, comparatively speaking, microscopic quantity of permanent humus. This point is stressed, not with the object of discouraging the growing of these valuable crops, which bestow upon the soil a wealth of beneficial effects, but rather to show farmers that they must not delude themselves into the belief that by green manuring they are building up reserves of humus in the land. For the canegrower there is, fortunately, a valuable source of material at his disposal, the use of which will enable him to effect this desirable purpose; this material is the cane trash and tops which remain on the field after harvesting, and which are so frequently regarded by the grower as a nuisance which must be tolerated until such times as he can apply a firestick and send up the potential humus-forming material, together with its valuable nitrogen in the form of smoke. But the problem of trash conservation is receiving the very careful attention of the Soils Laboratory of the Bureau, and it is hoped that the practical difficulty which its conservation entails will be overcome before long.

To conclude this necessarily sketchy review of the important subject of soil moisture, it must be emphasised that the working out of a cultural system best suited to any particular farm or soil type must be left in the hands of the individual farmer. He must make a careful study of his particular conditions, and with the essential principles clearly in mind, he should adopt those methods which aim—firstly, at the creation of conditions most favourable to the ready absorption of the rainfall; secondly, at the maintenance of these conditions as far as possible throughout the lifetime of the crop; and, finally, to make every effort to conserve this moisture against loss through weed growth or free evaporation from the compacted moist land surface. He will find that practices which achieve these purposes will be those which make for the most economic utilisation of available moisture and the production of maximum crop yields. The provision of an abundance of plant food in the soil is one of the surest means at the farmer's disposal for ensuring that the soil moisture will be employed to the best advantage. Under otherwise identical conditions, the rich soil will always produce a heavier yield, for a given water supply, than one poorly supplied with available nutrients.

PRACTICAL APPLICATION OF PRINCIPLES.

In this, the concluding talk of the series, it is proposed to discuss certain important aspects of sugar-cane agriculture in the light of the principles previously outlined. The farmer's first consideration, in this respect, is the preparation of the land for planting. No hard and fast rules can be laid down for the number of ploughings, harrowings, or other preparatory treatment to be employed, for this depends so much on local factors. The grower must develop his own system in the light of his past experience. There are, however, several important points which should be kept clearly in mind. The objective is the production of a deep, moist, mellow seed-bed in which conditions are most favourable for rapid germination and ready development of the young crop. It may require six ploughings with intermediate harrowings to produce this, or it may be done by two. But it is well to remember that the minimum of work which is necessary to produce the desirable seed-bed, the better it will be for the land. We should be quite clear on this point; there is no virtue in ploughing the soil six times in an attempt to reduce it to a

state of good tilth. On the contrary, such a practice indicates either a difficult, intractable soil or lack of timely work on the part of the farmer.

It is well appreciated that a soil which necessitates this treatment is generally in an unsatisfactory final condition. Either it is still lumpy or has been reduced to dust. There is a definite time at which almost every soil can be worked most easily, when it will readily mellow and crumble under the action of the implement. This condition depends entirely on the moisture content of the soil, and growers could well pay more careful attention to this factor. If worked at a higher moisture content the clay particles run together, the soil becomes puddled, and breaks up in hard clods. If worked when very dry, the soil crumbs are broken up to give a dusty soil which exhibits those same undesirable characteristics with the first rains. With the more general use of the disc plough—certainly a very valuable implement in its place—it is felt that insufficient attention is paid to the condition of the soil for ploughing, and very frequently this important operation is deferred until the soil has become too dry.

With regard to the depth of working, it is doubtful whether any benefit is to be derived from ploughing to a greater depth than 10 inches of compact soil. For the second or subsequent ploughing, this would mean about 12 inches of loose soil. Certainly the soil should be opened up to greater than plough depth, but the breaking up of the subsoil should be carried out with the subsoiler, which brings none of this raw material to the surface. In its influence on moisture conservation, the value of subsoiling cannot be overstressed, provided the work is done in season. The correct time to carry out the operation is when the land is being broken up, in advance of the wet season. Besides the beneficial effects of large volumes of water which may thus be stored, to a depth of several feet, it must be borne in mind that cane is essentially a deep-rooted plant, which, under favourable circumstances, will send its feeders down to 5 and 6 feet. The value of a store of moisture in the depth of the subsoil will be readily appreciated in prolonged dry spells.

It should be the aim of every cane farmer to grow and plough under a crop of legumes before planting his cane. For this purpose, Mauritius beans are preferred in the northern and cowpeas in the central and southern areas. In this connection, the superiority of the Poona pea should be recognised. This legume, which is closely related to the cowpea, is now finding great favour in Southern Queensland, for it withstands adverse conditions much better than the cowpea, and usually takes three or four weeks longer to attain full maturity; incidentally, it stands up better to any attack from the bean fly than cowpea. The use of this legume cannot be too strongly recommended to those growers who have difficulty in obtaining a stand of cowpea.

Any special treatment given to the land for the benefit of the leguminous crop will be effort well spent; and, far from being wasted, will facilitate the final preparation for cane after the legume has been ploughed under. A good cover of beans or peas is very valuable in its influence in lessening the harmful beating effects of heavy rain. Every drop of rain during heavy falls acts as a tiny hammer which tends to drive the soil grains together into a compact mass, and the value of the cover crop in eliminating this effect is well appreciated by those who carry out the practice. The legume will, in general, be ready to turn under somewhere between February and April. In general practice, if

this is done when the seed pods are in the milk stage the best results will be attained. Under warm, moist conditions, the succulent material will rot down within six or eight weeks, and the land is then ready for planting to cane if weather conditions are suitable.

It is the policy of the Bureau to advocate strongly the planting of the cane crop at this time. Soil moisture conditions are then excellent; usually the ground is warm, and a good germination may reasonably be expected. Under these favourable conditions the crop becomes readily established, and although it makes no apparent growth during the winter months, it is ready to take full advantage of the first spring rains to push ahead, cover in the rows, and be out of hand before the wet season. Further, by autumn planting, an important job is finished in advance of the busy harvesting season. There are many growers who strenuously oppose the practice, and under certain special circumstances the objection is valid. The superiority of autumn over spring planting has been so frequently demonstrated that it can be accepted as the more desirable practice.

When planting time comes, the question of the plant food supply for our crop should be dealt with. If the farmer has ploughed under a leguminous crop, he may safely assume that he has provided for the nitrogen requirements of the plant crop of cane. But it should be remembered that the beans or peas do not effect a gain in the plant food supply of the soil with respect to any other nutrient but nitrogen. Any phosphoric acid or potash which becomes available from the decomposition of the green manure was originally absorbed from the soil; and therefore, if a deficiency in the supply of either of these plant foods has been established for the particular soil, steps should be taken to apply the appropriate fertilizer materials which supply these needs.

If the crop is to make the best use of the added plant food, it is reasonable to suppose that the earlier it receives it the better. The truth of this has, indeed, been demonstrated repeatedly, and it is our practice to apply any phosphatic or potash-bearing fertilizers in the drill with the cane plants. When green manuring has not been practised, it will probably be found that the soil is lacking in available nitrogen, and in this case a top dressing of sulphate of ammonia should follow the earlier drill mixture. Nitrogen is a costly plant food, and one which is readily leached from the soil before it can be absorbed by the crop. For this reason it is recommended that the sulphate of ammonia be applied at a time when the root system is fairly well established, and it is generally found most convenient to apply it when the crop is stooling vigorously. This fertilizer should be distributed on the surface of the ground, alongside and close to the stools. It will be readily absorbed by the soil with the first rains or even with a heavy dew. It is not necessary to await rainy weather before making the application, and if applied in dry weather it will not evaporate, as is often supposed.

The subsequent treatment which the plant crop is to receive will depend entirely on climatic conditions. After every rain surface cultivation will control weed growth and restore the surface mulch which is so valuable in moisture conservation. If the soil becomes packed by heavy rain, deep cultivation is essential. In this case the grubber or subsoiler should be used to restore the open, absorptive condition in the land.

Remember the principles which were laid down earlier in this regard, and aim always at preserving those soil conditions which make for the ready absorption of moisture and the free penetration of the crop roots, to take full advantage of everything that is possible under the prevailing environmental conditions. It may be argued that the deep cultivation here advocated will result in harmful root-pruning, and this is certainly true. But the farmer must weigh the disadvantages associated with this operation against the distinctly beneficial effects which will follow. In general, the grubbing will be done comparatively early in the growing period and the crop will readily replace such surface roots as are thus removed.

Another important subject which should be discussed at this time is the method of ratooning to be employed. There is no doubt that the falling off in yield as between the plant crop and the succeeding ratoon is much greater than it should be, and calls for immediate attention. The first important point is that the ratooning season coincides with what is usually dry spring weather; therefore the available soil moisture must be guarded most jealously, for every drop is needed to start off the young ratoons. Under these circumstances, it is fatal to plough away the soil from the stools as is so commonly done. This generally leaves the soil in large clods, which are rapidly dried out, as is also the exposed side of the cane stool. Unless rain supervenes, it is impossible to work this soil back to a condition of good tilth, and the ratoons suffer.

It is certainly essential that the soil should be worked in order to facilitate the young ratoon roots in their search for moisture, and the use of our subsoiler canot be bettered for the purpose. When the trash is burnt off, as is the usual practice, it will be found that the compact surface soil is generally moist, even in dry weather. A suitable harrowing implement if employed immediately will restore a surface mulch and thus conserve what moisture is available. The use of the bumper discs for this purpose also destroys the uppermost eyes of the stool and promotes the germination of those lower in the ground. The importance of this feature cannot be over-stressed. The subsoiler should now be run along each side of the stools to a depth of 12 inches, by which operation the soil is reduced to a condition of good tilth without its being exposed to the sun and air to be dried out. We have produced those conditions which will best favour the development of the young ratoon roots, and our next operation is to provide them with the essential plant food to accelerate their growth. In this respect the need for fertilizer on ratoons is even greater than for the plant crop, and this is particularly true in the case of nitrogen. The mixed fertilizer should be applied at a depth of 3 or 4 inches alongside the stools, and the crop top dressed a few weeks later with sulphate of ammonia. As the crop develops, grubbing the interspaces with the subsoiler should be continued until finally the soil is restored to something approaching its original favourable tilth of planting time.

It is unfortunate that time does not permit of a discussion of many more of the important aspects of cane culture, particularly the consideration of such questions as trash conservation, land drainage, and the destruction of harmful substances such as acidity in the soil; however, it is hoped that these questions may be taken up at an early date.

THE HONEY BEE.

By HENRY HACKER, F.E.S., Entomological Branch.

THE honey bee has probably had longer associations with man than any other insect. The reason for this association is man's natural craving for sweets, and the fact that until recent times honey was the only accessible substance containing sugar in a concentrated form. It is not surprising, therefore, that man's interest in the honey bee goes back to prehistoric times. He was probably for thousands of years, like the bears, a systematic robber of wild bees until, possibly during the neolithic age, he became an apiarist by enticing the bees to live near his dwellings in sections of hollow logs, or in earthen vessels. Savage tribes keep bees to-day, and within their geographic range no people are known who have not kept them. They figure on the Egyptian monuments as far back as 3,500 B.C., and even the price of strained honey under some of the Pharaohs is known. It was very cheap—only about twopence halfpenny a quart.

The first reference to bees in Australian records occurs in a letter from Gregory Blaxland (1st March, 1805), asking for cargo space on the "William Pitt" for a "swarm of bees in cabin with wire cage over the hive." There is, however, no evidence of their safe landing. The first record of the actual introduction of bees occurs in a letter from Samuel Marsden to the Secretary of the London Missionary Society, in which he mentions that on his way back to the colony in the ship "Ann" he purchased, at Rio de Janéiro, two hives, which were safely landed on 27th February, 1810, and placed in the garden of Government House; these were the "black or English" bees. The Italian race was a much later introduction, between the years 1874 and 1878.

Species of Honey Bees.

In the family Apidæ, to which the honey bees belong, social organisation attains its highest phase of development. The single genus Apis comprises but four species—viz., *mellifera*, *dorsata*, *indica*, and *florea*. The largest and most primitive of these species is *Apis dorsata*, an Indian bee which forms large and massive, naked combs suspended from branches or rocks. It selects a locality where suitable flowers afford abundant supplies of nectar and, after these have ceased to bloom, the whole colony migrates to another situation and there constructs a new comb. On account of its nomadic life it has not been possible to establish this species of bee in apiaries. *Apis florea* is the smallest member of the genus. *Apis indica* and *mellifera* are so closely related that doubts have been raised regarding their specific distinction. They both nest in hollow cavities, especially those in tree trunks. *Apis mellifera* is the common honey bee of apiaries.

Collection of Nectar and Pollen.

As bees not only collect but transport nectar and pollen, several structures have been developed for this purpose. Two pairs of mouth parts are peculiarly modified for lapping or sucking up the nectar. In order to store this nectar while it is being transported to the nest, the crop or honey-stomach is large, bag-like, and distensible, and its walls are furnished with muscles which enable the bee to regurgitate its con-

tents. This is now known as honey because while in the crop it is mixed with a minute quantity of a ferment or enzyme, and undergoes a chemical change, its sucrose or cane sugar being converted into invert sugars (levulose and dextrose).

Even more striking are the adaptations for collecting and carrying the pollen. The whole surface of the bee's body, unlike other insects, is covered with dense, plumose hairs which easily hold the pollen grains until the bee can sweep them together into masses moistened with a little honey, and attach them to the outer surfaces of the hind legs. These parts are peculiarly broadened and provided with long hairs to form a special pollen basket.

Adaptability of the Common Honey Bee.

The spread of the common honey bee throughout the world is due, firstly, to its extraordinary adaptability to the most diverse flowers; secondly, to its habit of storing large quantities of honey; and thirdly, to its ability to generate heat from its food and thus maintain a rather high temperature in the hive during periods of cold weather, and conversely to reduce it when necessary by "fanning" with its wings, thus keeping an equable temperature within, irrespective of the conditions without. This unusual plasticity is peculiar to the species and is not the result of domestication. The insect, in fact, has never been domesticated in the same sense as farm animals; it is simply a wild insect induced to dwell near man's homes by being provided with conditions most suited to its comfort and prosperity, and its successful management is based entirely on a knowledge of its behaviour under the varying conditions of season and locality.

Bees possess a highly developed sense of smell, and this is the dominant factor in their communal life. Modern research has demonstrated that a number of distinct odours are present in the hive, such as the colony odour, the individual odour, the brood odour, the wax odour, and the honey odour. The hive odour is composed of a mixture of these, and every member of a colony, besides its individual odour, carries the hive odour which forms the basis of mutual recognition between bees belonging to the same colony.

To know the part that odours play in the behaviour of bees is of considerable importance to bee-keepers, because the introduction of queens, uniting, and various other manipulations may be performed more successfully.

Worker Bees.

As the vast majority of the inhabitants of a hive consist of workers, they will be considered first. The life of the worker bee may be divided into three periods, as follows:—

First Period.—The newly emerged bees prepare cells for the reception of the future eggs and also help in maintaining the right temperature of the hive. After the second day, feeding of the older larvæ with honey and pollen is taken over, and this goes on until the sixth day. From the sixth until about the fifteenth day, the pharyngeal or brood food glands are functionally active and the bees consequently devote themselves to feeding the very young larvæ. By the end of this time the pharyngeal glands tend to atrophy and brood-feeding ceases.

Second Period.—This is begun with their first flight from the hive, and for short periods in the middle of the day they may be seen flying in ever-widening circles around their hive while orienting themselves—that is, memorising their home or the place where it stands. Each day their flight is extended until they have learned the landmarks for a considerable distance around. During this period the bees also receive and store nectar from the foraging bees; they attend to the pollen brought in and act as general workers in the hive. Bees of this age have their wax glands in the active secretory phase. If they are watched closely during the height of the honey harvest there will be found little pearly discs of wax, somewhat resembling fish scales, protruding from beneath the second to the fifth ventral segments of the abdomen. These are scraped off with the legs and after being masticated and manipulated in the mandibles the wax is applied to the comb. Towards the close of this period, which lasts for about ten days, the bees may take on the function of guarding the hive entrance.

Third Period.—In this period, which is from twenty to thirty days' duration, the workers are active only in the field and are engaged in foraging for water, pollen, and nectar. They continue at this work until they die.

As fresh bees hatch from the cells successively, there is always a number of them of different ages occupied on different duties.

Drones.

The drones or males are readily distinguished from the workers by their greater size, their large eyes, and the absence of a sting. They are produced in some numbers seasonally by prosperous colonies, and towards the end of summer they are cast out of the hive by the workers. Both drones and workers are relatively short-lived.

Queen Bees.

Normally there is only a single queen in the colony, and she will not tolerate the presence of another young queen.

Swarming takes place by the old queen leaving the colony accompanied by a large detachment of workers when a young queen is about to emerge from her cell, and if several young queens are to emerge in succession, the older leaves before the next appears.

When the queen's eggs are fertilised they develop into workers or queens according to the way the larvæ are fed, but when unfertilised into males or drones, as is also the case with the eggs that are sometimes laid by workers.

Except in the development of her ovaries, the queen bee is a degenerate female, a mere egg-laying machine, entirely dependent on her worker progeny. The pollen-collecting apparatus of the hind legs is undeveloped, her tongue and sting are shorter, and her brain is smaller. That these differences are due to larval feeding is proved by the experiment of transferring eggs and very young larvæ from worker to queen cells and *vice versâ*. Transferring eggs from drone to worker or queen cells does not, however, alter the sex of the insect reared, since it develops from an unfertilised egg.

Under normal conditions the time required for the development of each of the three castes differs, so also does the chemical composition of the food administered to the larvæ of each caste. The composition

of the food, which for the queen and the earliest stages of the workers and drones is known as royal jelly, is a secretion of the pharyngeal glands of the worker nurses. The queen, although the largest of the three castes, reaches maturity in about sixteen days. She is fed only on "royal jelly" without admixture of honey or pollen. That highly nutritious ration (43·14 per cent. proteid) is undoubtedly responsible for her very rapid growth. The worker is given pollen and honey after the fourth day and requires twenty-one days to complete her development. The feeding of the drone is similar but he receives less sugar and more fat, and his development is protracted to twenty-four days.

The foregoing considerations suffice to show the complexity of the whole matter of sex determination and caste differentiation in the honey bee. The main object of the rich and abundant food administered to the larva of the queen honey bee is evidently the rapid development of her ovaries, so that she may begin to lay eggs very soon after emergence. The great size of her ovaries accounts, of course, for her extraordinary fecundity and the size of her colony. Cheshire computed the number of eggs which may be laid during her lifetime by a vigorous queen as about 1,500,000. It is not surprising, therefore, that a hive, at the time of its maximum development during the early summer, may contain 50,000 to 60,000 or even 70,000 to 80,000 bees.

Value of the Honey Bee to Man.

As a final consideration it should be remembered that, in addition to its honey production, man is greatly indebted to the bee for the important part which it plays in the fertilisation of fruit trees and other economic plants.

WARNING TO TOBACCO GROWERS.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) in referring recently to the expansion which has taken place in the tobacco-growing industry, remarked that, regardless of warnings issued by the Department of Agriculture, many prospective growers have taken up land and engaged in the industry on a commercial scale in districts where tobacco had not hitherto been grown. A large number, moreover, have not had any previous knowledge of agriculture, consequently the results have naturally been in many instances unsatisfactory.

Although cultural and curing methods are of much importance, it is a well recognised fact that soil and climate are the main determining factors in the production of a high-quality tobacco. The suitability of a soil for the growing of an agreeable smoking tobacco can only be ascertained by actual experiment. If this were not so, the necessity would not arise for the large expenditure of time and money in exploring the possibilities of various districts for tobacco growing. It required some four years of actual experiment to definitely prove that Mareeba is a district where tobacco acceptable to the manufacturers' needs can be profitably grown. Growers are therefore strongly advised against the growing of tobacco upon a commercial scale on untried land, or until such time as the suitability of soil and climate, at least in their particular locality, has been determined. Farmers who own land could, however, test the possibilities of tobacco by growing a small patch, say, 100 plants, and submitting samples of the resultant crop to the Department of Agriculture and Stock for examination and report.

Prospective tobacco growers are specially warned not to be influenced by statements made by vendors of land who claim that the land they are offering is suitable for tobacco. In many cases no proof of this assertion is forthcoming, and men have gone on to blocks of land which are claimed to be suitable for tobacco, only to subsequently find that they have been entirely misled by the vendors.

POWDERY SPOT AND FRUIT SCAB OF THE PASSION VINE.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

DURING an investigation into the brown spot disease of the passion vine, the presence of another foliage and fruit disease became manifest. This disease, which has been designated powdery spot or alternatively scab when affecting the fruit, is not of such serious consequences as the common brown spot. This is partly due to the fact that the former disease is more restricted, both in its seasonal occurrence and distribution. However, it is of sufficient interest and importance to justify the following notes which are mainly based on observations made incidental to the investigation of brown spot.

Symptoms.

Powdery spot restricts its attentions to the younger terminal shoots and fruit. On the leaves the disease first appears as a small, circular, translucent spot, with a narrow faintly-brown border. This spot may enlarge to from 3 to 6 mm. in diameter, but seldom more, a definitely circular shape being retained throughout. The spot is at first entirely translucent, but later a grey powdery area commences to form from the centre outwards on either the upper or lower surface, this being due to the fructification of the fungus associated with the disease. Finally, the original translucency is obscured. (Plate 37.)

These spots are usually sparingly scattered over a leaf, but may be numerous when coalescence produces a larger irregular more or less water-soaked area.

Spots closely resembling those on the leaf may occur on the sepals of the young bud or open flower. These lesions probably have a direct relation to the development of the fruit scab later described, since the floral structures persist in the dry condition until the fruit is of considerable size, and any spores produced thereon will naturally tend to become washed down over the young fruit.

Lesions also occur on the younger parts of the runner, petiole, and tendril, when they take the form of a brown sunken area usually partly filled with the powdery spore mass. (Plate 37.)

The effect produced on the fruit has previously been ascribed by growers and others to various causes, including insect attack. The lesions commence as minute, light-brown, slightly depressed dots, which enlarge until they are from 2-3 mm. diameter, at the same time retaining a definitely circular shape. By growth of rind tissue round the margin of the lesion the affected area is raised somewhat above the general level of the surface, so that a crater-like effect is produced. (Plate 39.) Close examination of the lesions at this stage shows that the outer layers of the rind are constituting a thin shell covering a small cavity. Under the right climatic conditions this covering may bear a thick dusky coat of spores, similar to that occurring on the leaf lesions. Sooner or later the thin and brittle cover becomes ruptured, leaving a more or less irregular cavity lined with loose light-brown tissue. At a

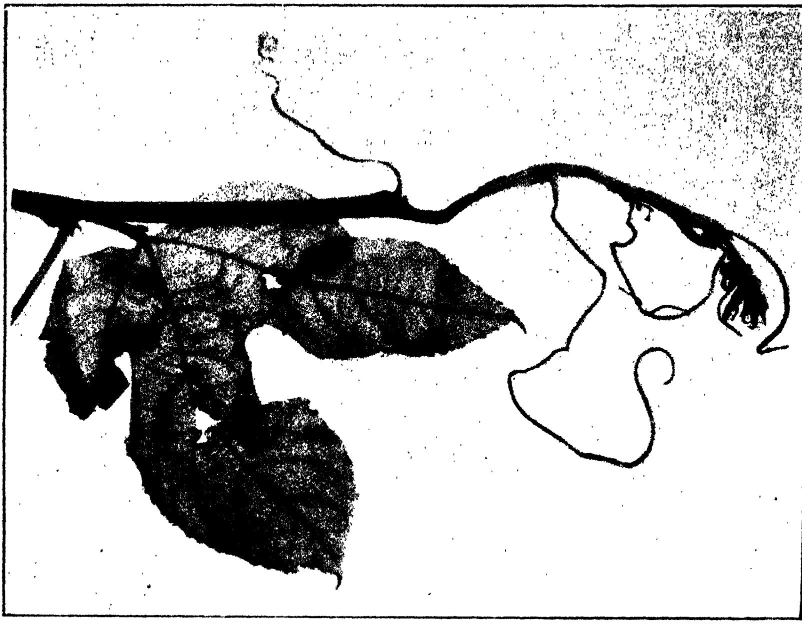

PLATE 37.
Terminal shoot of passion vine, showing defoliation and lesions on stem and leaf caused by powdery spot (*Cladosporium sp.*).

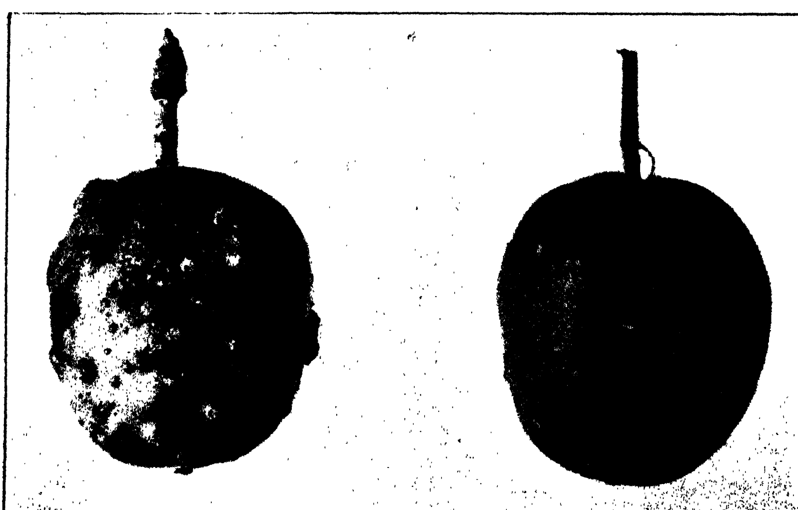

PLATE 38.
Left: Fruit of passion vine (*P. edulis*), showing final stage of scab formation.
Right: Fruit of *P. herbertiana* similarly affected.

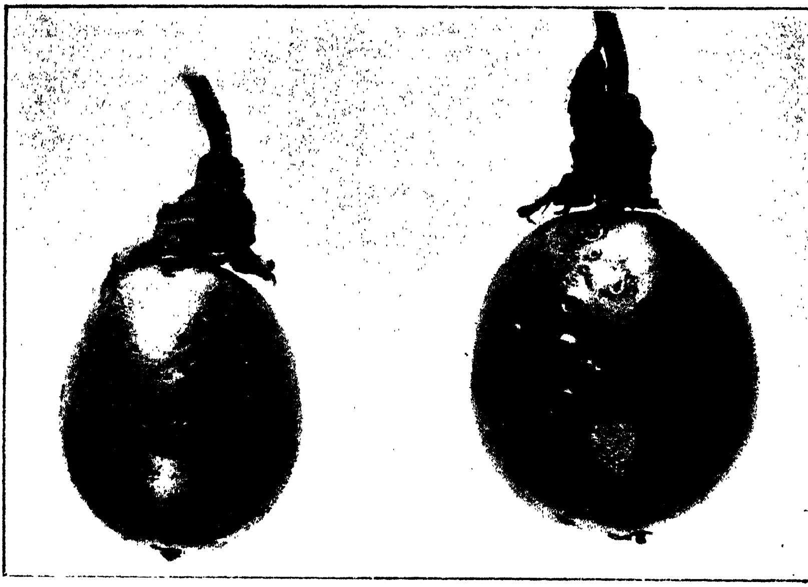

PLATE 39.
Fruit of the passion vine, illustrating early stages in scab development; epidermal layers mostly intact and bearing spore mass.

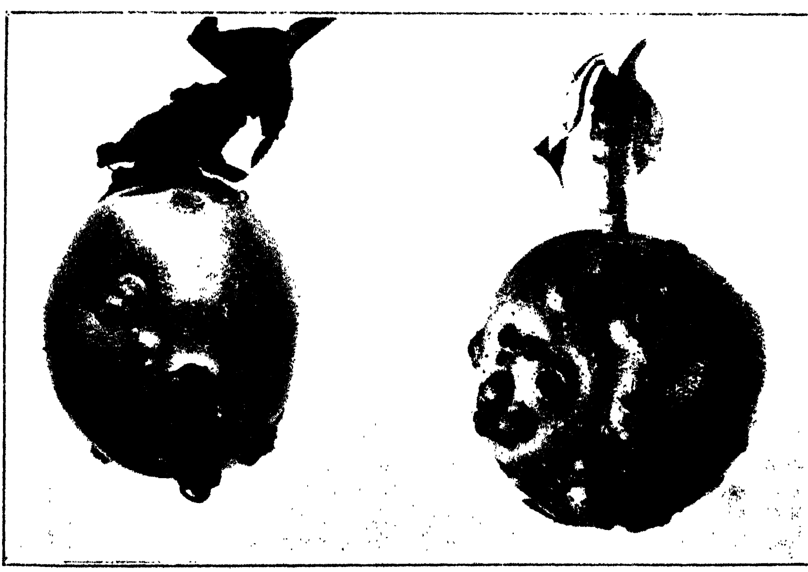

PLATE 40.
Passion fruit showing the final stages in scab formation; elevation of scab tissue taking place.

further stage, vertical growth is stimulated below the excavation, with the result that the corky tissue lining it is eventually elevated into a definite dome-shaped or fissured scab of from 1-3 mm. in height. (Plate 40.) At this stage, practically all trace of their fungus origin has disappeared.

Development of Fruit Scab.

As has been pointed out by Noble[1] the pericarp or rind of the passion fruit consists of an outer epidermal layer one cell wide, a subepidermal layer three cells wide, a well defined band of thick-walled closely packed sclerenchymatous tissue three or four cells wide, below which is the main section of the rind consisting of parenchymatous tissue, interspersed with vascular and fibrous elements.

Microscopic examination indicates that after infection the fungus is at first dominant, and a small semi-circular cavity is formed by the disintegration of the parenchymatous tissue, amongst the debris of which fungal hyphæ may be found. Completely covering this cavity externally is the thin and brittle veil formed from the epidermal and subepidermal layers, supported by fungal hyphæ, and bearing a mass of conidiophores and spores. (Plate 41, fig. 1.) The cells of the sclerenchyma adjacent to the region of invasion undergo a certain amount of degeneration, much of their thickening being lost, until their differentiation as distinct from parenchyma practically disappears.

Before this destruction has progressed much more than a millimetre or two inwards, cells below the excavation take on a meristematic function, and eventually a definite phellogen appears. From this there is produced on the outside a few layers of a corky nature, and from the inner side definite radial rows of a tissue consisting largely of sclerenchymatous elements. It is the continuous formation of this latter tissue which eventually ruptures the covering veil and produces the hard scabby excrescence. (Plate 41, figs. 2, 3.)

The tissue of the passion fruit rind appears easily stimulated to form intumescences of this nature, as small warts of a similar appearance and construction to the fungus-induced scabs may be produced by lightly pricking the surface of young fruit under sterile conditions, and placing them in a moist chamber for several days at 21 deg. Cent.

Apparently it is usual for infection of the fruit to take place during its early stages of growth, while the raised scab stage may reach its final dimensions after full diameter is attained. A slight deformity of the mature fruit may accompany the presence of one or more scabs, owing to a restriction in the growth of rind tissue immediately surrounding the point of infection.

Effect on the Plant.

As will be pointed out later, powdery spot is of seasonal occurrence and attacks the vine with severity only during the cooler winter months, and hence the quantitative loss resulting is not so great as might otherwise be the case. Nevertheless, the winter crop which is affected is usually the one fetching the best price throughout the year.

The passion vine leaf reacts to the presence of powdery leaf spot in much the same way as when infected with brown spot. That is to say, the leaf usually falls soon after being attacked, and hence considerable

Fig. 1.

Fig. 2.

Fig. 3.

Plate 41.

Free-hand sections of rind of passion fruit attacked by *Cladosporium sp.* indicating method of scab formation (x 17). Fig. 1. Early stages of infection; phellogen appearing below margin of invasion; veil broken in sectioning. Fig. 2. Radial growth under way. Conidiophores of *Cladosporium sp.* still present on the intact veil. Fig. 3. The scab formed; remains of veil left as lateral scales; phellogen lying between superficial corky layers and radially arranged tissue forming bulk of scab; general rind tissue below.

defoliation of the younger terminal leaves—the only ones affected by this disease—may take place. Sometimes the leaves do not fall, but a deformed and shot-hole condition results at maturity. During an epidemic, the runners up to 6 inches or a foot back may be spotted and cinctured, with the result that the shoots wilt and die back. (Plate 37.)

With a quickly-growing plant such as the passion vine, the resulting effect of damage such as described above is not of a permanent nature. It is different, however, with the fruit. When badly scabbed these may be rendered quite unfit for market, or when less blemished a reduction in grade may be necessary. A considerable loss in winter and early summer crop fruit may be experienced from this cause.

In contrast to the case of brown spot, powdery spot is most serious on young vines up to eighteen months to two years old. The succulent foliage and fruit formed on vines of this age appear specially subject to attack. Moreover, the effect is much more pronounced on a young vine when the number of fruiting laterals is more limited.

Cause of the Disease.

Associated with the lesions of powdery spot on leaf and stem and with the early stages of the disease on the fruit is almost invariably to be found a species of *Cladosporium*. Attempts to obtain artificial inoculation with this fungus under field conditions were not successful. This was no doubt due to the somewhat restricted temperature and moisture requirements of the fungus, as typical lesions were subsequently obtained by inoculating young leaves held in moist petri dishes at temperatures between 15 deg. Cent. and 25 deg. Cent. Infection was obtained through uninjured surface, though less readily than when the leaf was pricked. There was no difficulty in reisolating the *Cladosporium* from these lesions. This, together with the universal association of the fungus with the disease, especially in the early stages, is considered sufficient justification for assuming its causal relationship.

No previous mention of a passion vine disease of this nature has been seen, unless it is a reference made by Cobb[2] in 1903. In an article entitled "Diseases of the Passion Vine," he described a torn and shot-hole appearance of the leaves with which was associated an Oospora-like fungus. The description and diagrams given might easily refer to a *Cladosporium*, such as the one under consideration. The spore measurements (4-6 by 9-16 μ, averaging 5·7 by 12·6 μ), although not entirely agreeing, do not differ greatly from those of the Queensland species.

In the absence of the necessary literature no attempt has been made to establish the specific identity of the *Cladosporium* associated with powdery spot.* The parasitic organism can be readily distinguished from species of the same genus commonly found associated with the passion vine in a saprophytic capacity by certain cultural characters on potato dextrose agar. These are (1) the length of time taken for colonies to become visible—usually three days at 27 deg. Cent.; (2) the chocolate-brown restricted and convoluted nature of the

* With a view to obtaining definite identification, both the *Cladosporium* from powdery spot and the *Macrosporium* causing brown spot have been submitted to the Imperial Mycological Institute, Kew.

growth at temperatures above 25 deg. Cent. in contrast with the flat spreading type of the saprophytes; (3) the absence of a white mycelial overgrowth in old cultures.

Two types of spores are found both in nature and in culture. The more abundant form is small oval to elliptic continuous, with an articulation collar at one or both ends. The other is a more elongate type, almost cylindrical in shape, continuous or one septate with an articulation collar at both ends. Although intermediate forms exist and both may be formed in series on the one conidiophore, it has been found more convenient to constitute two classes for the purpose of spore measurements, which are as follows:—

Host.	No.	Cylindric Type.				Elliptic Type.			
		Length Mean.	Breadth Mean.	Length Extremes.	Breadth Extremes.	Length Mean.	Breadth Mean.	Length Extremes.	Breadth Extremes.
P. edulis	50	13·7	4·2	8-21	3-5	6·1	3·9	2·5-8	2·5-5
P. herbertiana ..	30	11·6	4·0	9-16	2-5	6·3	3·7	4-8	2-4·5
P. alba	30	11·0	4·3	7-16	3-6	6·5	4·0	4-8	3·5-5

Other Hosts.

Passiflora herbertiana, a native species found sparsely distributed throughout the coastal rain forest country of Queensland, has on somewhat rare occasions been found to exhibit a disease identical in its foliage and fruit symptoms to the powdery leaf spot and scab of *P. edulis*. A *Cladosporium* may be obtained from the wild vine similar as regards cultural and morphological characters to that associated with the disease on the cultivated passion.

A powdery leaf spot has been found on the white passion flower (*P. alba*), also showing a general resemblance to the disease on the other two species. No fruit symptoms, however, have been observed on this host. The cultural characters of the associated *Cladosporium* would suggest that this organism is distinct from the one occurring in the other two cases.

It is interesting to note that, while it is very common for *P. alba* to be affected with a disease identical with the brown spot of the passion vine caused by *Macrosporium* sp., *P. herbertiana* has never been known to be affected with this disease.

Distribution.

So far the only records of powdery leaf spot occurring on *Passiflora edulis* are from two widely separated districts. These are Tamborine Mountain, a district situated not far from the southern border, and the Evelyn Tableland, in North Queensland. Both of these localities are high, the former being 1,600 feet and the latter 3,000 feet above sea level. This distribution is interesting when considered in the light of some of the physiological relationships of the fungus concerned.

On *P. herbertiana* the disease has been found on rare occasions in the Gympie and other South Coast districts, as well as at Tamborine Mountain. The allied form on *P. alba* has been recorded mainly from coastal districts, with the Northern limit at Innisfail.

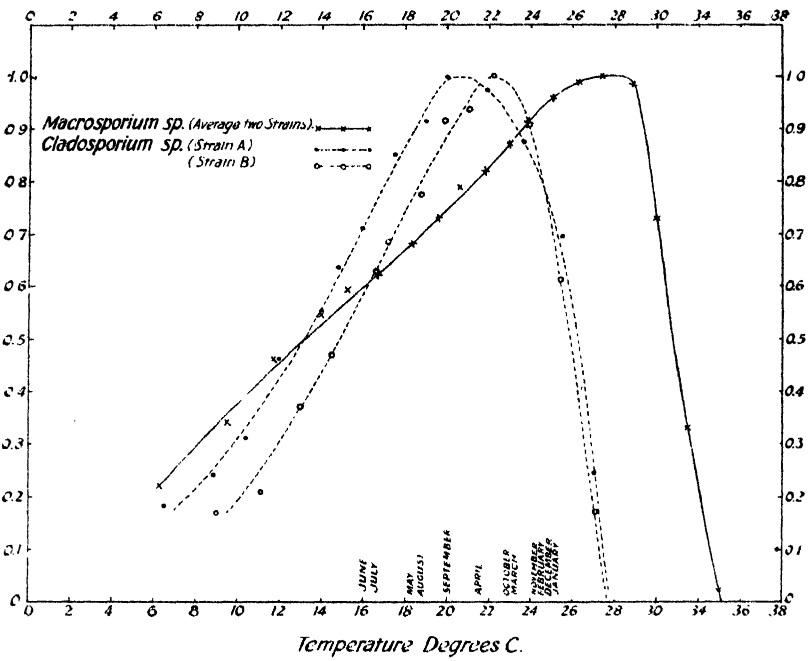

PLATE 42.

Fig. 1.—Growth-temperature curves of *Macrosporium sp.* (average of two strains) from brown spot and *Cladosporium sp.* (two strains) from powdery spot of passion vine. Six days' growth in the case of the former and approximately four days' growth in the case of the latter on potato dextrose agar. Ordinate values expressed in terms of the corresponding maximum growth in millimetres taken as unity in each case.

Temperature Relationships and Seasonal Occurrence.

It is interesting to compare the temperature relationships of the *Cladosporium sp.* associated with powdery spot and the *Macrosporium sp.* causing brown spot, and note the corresponding differences in seasonal development of the two diseases.

Brown spot normally occurs in the months of August to March, inclusive, being most serious during the summer months of October to January.

Powdery spot, although it may be seen as an isolated lesion at most times throughout the year, usually becomes sufficiently prevalent to be noticeable only by April. By June and July the disease may reach its peak, and considerable leaf and fruit spotting and terminal die back may be present at this time. Foliage symptoms become less abundant as the weather becomes warmer in the spring, but the fruit may exhibit

the results of an earlier infection by the presence of raised scabs as late as November. At times an early setting of summer crop fruit may also become scab infected.

Examination of the growth temperature curves given in Plate 42 will help to explain these differences. The *Cladosporium sp.* has a maximum of 28 deg. Cent. and an optimum ranging from 20 deg. Cent. to 22 deg. Cent. The maximum for the *Macrosporium sp.* is 35 deg. Cent., while the optimum lies very close to the maximum for the *Cladosporium*. With both organisms spore germination is favoured by the same temperatures as is vegetative growth. This is in accordance with the leaf infection studies with *Cladosporium* before mentioned, where lesions were produced readily between 15 deg. and 25 deg. Cent., but scarcely at all outside this range.

It was also demonstrated during the attempts to obtain leaf infection with *Cladosporium* that abundant moisture is necessary for this to take place, and that young leaves are much more susceptible than those which have commenced to harden off.

In Plate 42 the mean maximum shade temperatures per month over the last six years at Tamborine Mountain have been indicated by inserting the name of the month opposite the appropriate temperature reading. Reference to this would suggest that it is the high temperatures of the four summer months which largely determine the marked difference in the seasonal activity of these two passion vine diseases.

The restricted distribution of powdery spot is no doubt also due to the cool moist conditions required by the fungus concerned. These are much more nearly satisfied in a situation such as Tamborine Mountain than in the warmer and dryer regions of lower elevation.

Control.

Any attempts made to control powdery spot have been incidental to experiments conducted for the control of brown spot. For details regarding these, the reader is referred to an article on the latter disease which appeared in the "Queensland Agricultural Journal" for December, 1930.[3]

The experience has been that the pruning and spraying operations carried out for the control of brown spot will result in a satisfactory control of powdery spot also. The recommendations made in the case of the former disease are as follows:—

(1) Train the passion vine in a systematic manner from the start, making sure that the main runners are kept well tied to their respective wires, as this facilitates subsequent pruning.

(2) Prune back laterals at least once a year, either before the flowers for the summer crop have formed, if a summer crop is desired, or later if the intermediate and winter crop is most favoured. A further trimming may be necessary after the vines have begun to shoot.

(3) Follow the pruning with a Bordeaux spray of 6-4-40 or 4-4-40 strength. This spraying should be repeated once a month until the end of January, and then once every six weeks or two months until next pruning time. When mature fruit are on the vine, ammoniacal copper carbonate may be substituted for the Bordeaux.

For powdery spot the Bordeaux spray must be present during the cooler months from April to August at a time when applications for the control of brown spot are not usually necessary. Special attention should be paid to the young foliage and fruit which are the portions of the vine susceptible. Hence the outer rather than the inner portions of the vine need careful attention while spraying. Young vines up to two years old being specially subject to damage by powdery spot need more attention than do older plants.

It is inadvisable to prune passion vines during periods of dry weather, as extensive dieback may result under these conditions.

Another word of warning is necessary to those growers who have the disease known as woodiness in their plantation. This disease, characterised by the production of small, hard, and usually deformed fruit and a mottled and crinkled condition of the foliage, is of the virus type, and is capable of being transmitted from plant to plant on the pruning knife or even the hand. It is therefore essential that any plants showing symptoms of this disease should be cut off at the base and allowed to die out before pruning is commenced. The hands and any implements having touched a woody vine should be washed well in soapy water before passing to a healthy vine.

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[2] COBB, N. A.—Letters on the diseases of plants: Agric. Gaz., N.S.W., 1903, xiv., 973.

[3] SIMMONDS, J. H.—Brown spot of the passion vine, Queensland Agri. Journ., 1930, xxxiv., 564-585.

IMPORTATION OF MAIZE—A PROTEST.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) announced recently that he was keeping in close touch with the movement for the importation of maize into the Commonwealth. There is evidence that approach has been made to the Federal authorities with that object in view. Mr. Bulcock, in communicating with the Federal Minister directly concerned, requested that the prohibition against the importation of maize and by-products from overseas shall be continued at least until such time as the supplies of maize within Australia are absorbed.

The matter is of considerable importance to Queensland as the farmers of this State, under normal conditions, produce maize in greater quantity than growers in any of the other States. Throughout Southern Queensland the maize crop of last season was seriously affected by an unusually dry summer. Similar conditions prevailed in New South Wales. The Atherton Tableland crop, above average in tonnage, will, however, go a long way towards meeting Australian requirements. Harvesting is well advanced, and it is obvious that no importation of this cereal should be allowed until such time as the supplies within Australia are utilised.

At present, there are sound economic grounds for opposing any suggestion to import grain. Australia to-day is not in a position, financially, to engage in the importation of maize or any other commodity while supplies of same are available within the Commonwealth, and thereby help to create an adverse trade balance, particularly as the grain imported would probably be the product of coloured labour.

Farmer organisations, such as the Provisional Maize Board and the Atherton Tableland Maize Pool, have protested to the Minister against the suggestion to lift the maize embargo at this juncture.

THE PIG FARM.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

When the pig is considered as a pork-producing machine, it is apparent that the machine must be kept in perfect working order, that is, in good health, if it is to work up to its full capacity, and one of the first essentials to good health in pigs is comfortable and clean accommodation. Pig-raisers will welcome Mr. Downey's practical notes on an important subject.

PLANNING THE PIGGERY.

MUCH inconvenience may be prevented if the piggery is carefully planned before operations are really begun, and following are some of the important points which should be considered:—

1. *Sufficient Enclosures to Keep the Stock under Control.*—Even the best pigs are liable to become a nuisance if they are not secured in proper enclosures, therefore good fencing is the first essential on a pig farm, but it should be remembered that well-bred and well-fed pigs are not nearly so restless as wild or badly fed pigs; also, the farmer should remember that the pig is naturally a grazing and foraging animal, and when it is given ample space to graze and exercise it is not so likely to try to break fences as when it is confined to too small an area; therefore, *the larger the paddock the less substantial the fence required to keep the stock secure.*

2. *Comfortable Housing for Stock.*—Climatic conditions in Queensland vary considerably during different seasons and in different sections of the State, and the accommodation required for stock must vary accordingly, but, on the whole, the climate is comparatively mild, and therefore elaborate housing is not essential to keep stock warm during winter or cool during summer, but, nevertheless, suitable housing to protect pigs from weather extremes is certainly essential and is recommended.

3. *Food and Water Supplies.*—The nature and source of the food and water supplies for his stock will largely influence the pig-raiser when planning his piggery.

4. Convenience for working the piggery must be carefully considered, together with physical features of the available land. Labour-saving appliances should be added wherever possible.

5. Finally, the cost of construction must be carefully watched at all times. While it is advisable to provide accommodation to safeguard the health of the pigs and to keep them producing to the best of their capacity, one must not be extravagant in the provision of accommodation, otherwise the animals will have to bear a heavy overhead charge which will consume too much of the returns.

Contrary to the old idea that the piggery was necessarily an objectionable and unsightly section of the farm, the pig accommodation can be made attractive and quite inoffensive with comparatively little expenditure, provided it is carefully planned along proper lines.

The type of piggery to be constructed will be determined by the locality, the extent of the pig-raising operations, the available land, the food supply, and time and capital available. Most pig farms in Queensland can be classed under the following headings:—

(i.) Agricultural and dairy farm piggeries, which comprise the greater proportion of the total.

(ii.) Suburban piggeries on much more expensive land.

(iii.) Slaughter-yard piggeries, usually situated on soil that is not very productive from an agricultural point of view.

(iv.) Buttermilk piggeries: these are always associated with butter factories.

Photo. by courtesy of Principal, Dookie Agricultural College, Vic.]

Plate 43 (Fig. 1).

Pigs are most contented and healthy when allowed the range of succulent pasture paddocks.

LEGISLATION.

Pig raising is controlled to some extent by legislation under the Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable when about to construct or alter a piggery, to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress, or at increasing the cost of production.

The Value of Grazing Pigs.

The advantages of grazing pigs are—

(1) The pig lives in a more natural state.

(2) The pig enjoys sunlight, fresh air, and exercise, all of which assist in promoting good health.

(3) Living under clean conditions, the pig is contented, and its attendant is more contented in his job.

(4) If the grazing is good, the pig will obtain a portion of its food and may be encouraged to do part of its own harvesting.

(5) There is less risk of the pig suffering from deficiency of minerals or vitamins.

(6) By rotational grazing, and cultivation of pig paddocks, disease and parasites are kept in check, and the soil is fertilized. Rotational grazing on cultivation paddocks is one of the most practical sanitary precautions in the control of round worms and kidney worms, which are the cause of serious losses to the pig industry.

(7) It is easier to produce a lean, fleshy baconer or porker on pasture than in a small bare pen. Avoid the overfat pig.

Bearing these points in mind, every effort should be made in planning a piggery, to have ample grazing room for all pigs.

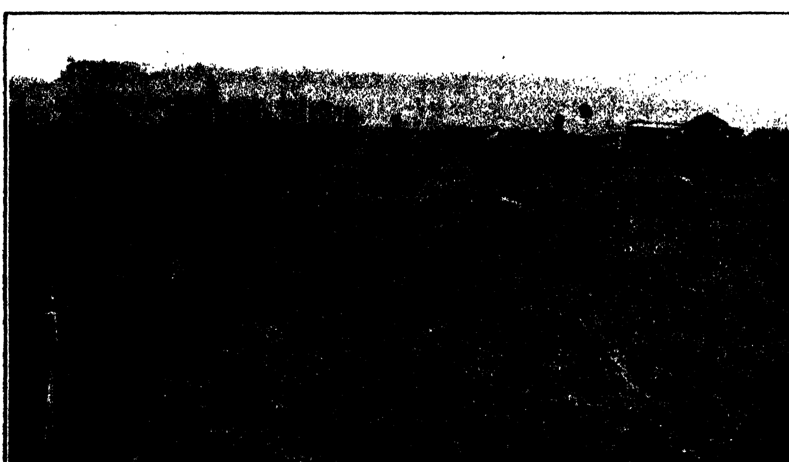


Plate 44 (Fig. 2).

A well laid out piggery where the pigs have lucerne paddocks to graze over and small shelter huts are provided.

Agricultural and Dairy Farm Piggeries.

Most dairy and mixed farmers keep at least a few pigs, while some make pig raising a fairly large and specialised section of the farm, hence the necessary accommodation must be determined by the extent of the operations.

It is most important in planning a piggery, to survey the extent to which the pig section of the farm may expand, and then to plan the whole undertaking on a definite system, because, without system, the piggery will be a disastrous muddle. The farmer should estimate the number of breeding sows he is likely to use and the accommodation required for that number, also a boar and the young pigs up to the porker or baconer stage. Also an estimate should be made of the area of land required to provide grazing and other feed for those pigs. The pasturage required per pig will, of course, vary according to the size of the animals, and the quantities of other foods, such as milk and grain, which are available for feeding to the pigs.

In selecting a site for the piggery, consideration should be given to the aspect so as to provide shelter from the prevailing winds, and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable for pig accommodation.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 feet from dairy yards and buildings. Where separated milk is to be used for pig feeding, the farmer should endeavour to have the piggery and dairy so situated that the separated milk may be conveyed down a line of open gutter piping from the separator-room to the piggery so as to save unnecessary labour which would otherwise be involved in carrying or wheeling the milk to the pigs.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Although it means economy in fencing to have square paddocks where pigs have to be fed in their respective paddocks, it would mean carrying the food too far to each trough, and for this reason the piggery will be more conveniently managed if long, narrow paddocks are provided. Long narrow paddocks are more suited to hurdling off, if it is desired to run the pigs on a portion only of the paddock. The paddocks should be large enough, however, to allow easy entrance of farming implements.

The plan shown in Fig. 3 is a suggestion for a piggery layout suitable for many dairy and agricultural farms in Queensland. Such a piggery is suitable for six brood sows, a boar, and the progeny up to six months of age. It must be understood, however, that this area of land will only provide grazing for this number of pigs if the pigs are supplied with such foods as milk, grain, &c., or if the paddocks are planted with crops producing heavy yields.

One of the best pasture grasses for pigs suitable for a wide variation of climatic conditions is Kikuyu grass. It is a palatable and nutritious grass and when properly established will stand a lot of grazing and rooting by the pigs.

The system aimed at in the plan shown in Fig. 3 is to have the six brood sows divided into three lots of two, having two sows to farrow every two months. This can be fairly well regulated when the boar is kept in a separate run and it gives more control over the breeding and provides a regular supply of pigs throughout the year, particularly when fodder crops are grown regularly to supplement the milk supply.

Although the shelter sheds shown in this plan are double sheds with a dividing wall, individual sheds, either fixtures or movable, built on skids, could be used. Concrete feeding floors with set-in troughs are shown, but these could be replaced with well-made movable wooden troughs and feeding floors.

The plan shows the pig runs opening out into a lucerne paddock which could at times be grazed off by using a temporary fence to hold the pigs on a small section of the crop. The 16-foot laneway and loading race, at one end, together with the movable hurdles shown in the plan, are necessary for convenient handling of the pigs for drafting and loading.

Suburban Piggeries.

In close proximity to cities and large towns are piggeries maintained on commercial lines where the waste foods and products from hotels, boarding-houses, shops, markets, and similar places are put to good use as pig food. Similar piggeries are also operated in conjunction with institutions such as colleges, hospitals, sanatoriums, and asylums.

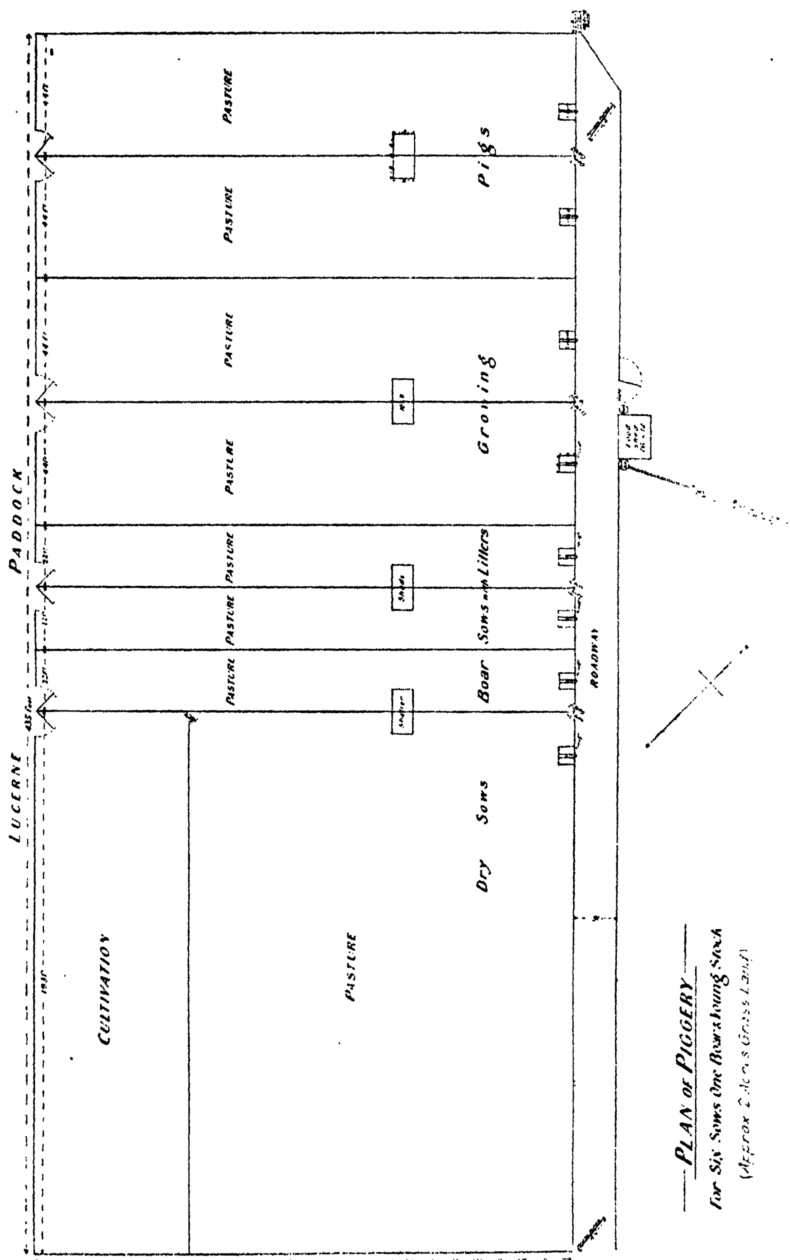


PLATE 45 (Fig. 3).

At such places land values are usually high and good cultivation and grazing land is not always available, hence for these reasons stock at such piggeries are usually kept on an intensive system in well-constructed pens and sheds which cover a comparatively limited area of ground. Even under this system of pig raising, however, limited grazing is often provided, and if properly managed should prove profitable.

Conveniences for cooking the food must be provided at piggeries where garbage is fed; and, of course, this particular system of feeding necessitates special layout of pens, feeding troughs, and floors. When pigs are confined to small areas in such a piggery it is essential that the floors of the pens should be impervious to moisture and be well drained, while a plentiful supply of water for drinking and cleansing purposes is necessary.

Slaughter-house Piggeries.

Slaughter-house piggeries are somewhat similar to suburban piggeries in that the pigs are mostly kept on the intensive system, and therefore well-constructed accommodation is required. Impervious feeding floors and troughs are necessities. The Slaughtering Act requires that piggeries should be at least 240 ft. from the slaughter-house. Boiling appliances are also here necessary, as all offal and meat fed to pigs must be thoroughly boiled.

Butter-milk Piggeries.

Butter-milk piggeries derive their main food supply from butter factories, the milk usually being conveyed from the factory to farm by a metal or wood pipe-line, although sometimes the milk is carted in tanks or drums. Such piggeries usually carry up to 1,000 pigs.

On a piggery of this type where a large number of pigs are to be kept, it is necessary to economise in labour; hence the feeding arrangements should be conveniently arranged, and where a large number of pigs are to be brought together for feeding, it is desirable to have concrete feeding troughs and floors. Similarly, where large numbers of pigs are housed together on a small area, it is desirable that the floors of the houses should be of an impervious nature, preferably of brick and cement or concrete.

Where pigs are compelled to remain confined in pens with concrete floors it will be a great advantage to provide a wooden sleeping platform, where the animals may camp and be comparatively free from danger of rheumatism and pneumonia, which often occur when the animals are forced to lie on concrete during cold and damp weather. The wooden platform should cover a portion of the concrete floor sufficient to allow of all pigs sleeping thereon, and may either be a movable section or it could be made of 1½-inch flooring set in the concrete and tarred over.

Although a central type of pig-house is usually erected at butter-milk piggeries, the paddock system with individual houses could, in some cases, be adopted with advantage, provided due provision is made for a system of feeding troughs which can be maintained in a sanitary condition.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

SHEDS.

There are numerous types of sheds suitable for different piggeries, and the type most suitable to a particular farm will have to be determined by the farmer, and conform with his local conditions. Certain requirements are general in all piggeries. A shed suitable to use for a sow and litter or about ten growing pigs, or a boar, or about four brood sows would need to have a floor space of approximately 8 feet by 8 feet, but extra space in a shed is an advantage; also with larger sheds, temporary partitions can be used to provide a number of separate sections. The height of pig-houses should be sufficient to allow a man to move about inside without difficulty; nothing under 5 feet is satisfactory.

Considering Queensland's warm climate, ample provision should be made for ventilation, and yet there should be no cracks about the lower portions of the sheds to allow direct draughts to blow on to the pigs and cause chills.

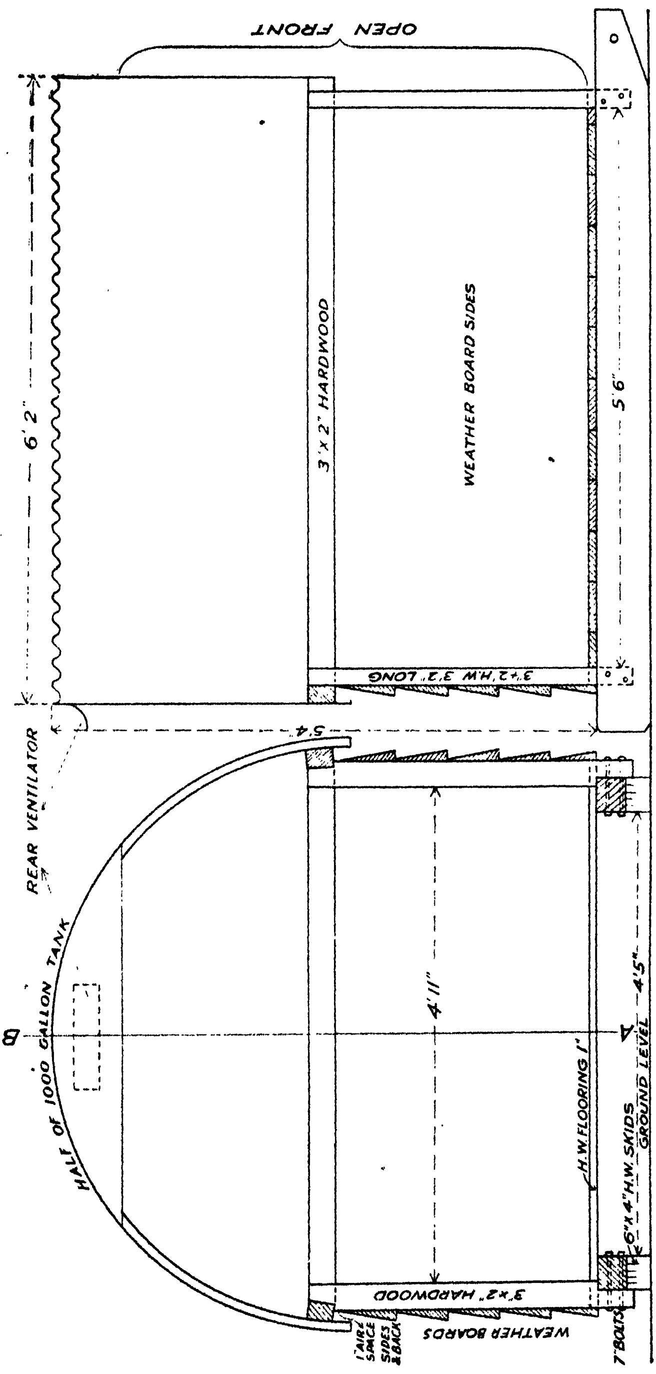


PLATE 46 (Fig. 4).

Plan of a portable shelter shed, using half a water tank. Note skids on which this shed is constructed, providing for ready means of moving the house when required.

Photo. Ministry of Agriculture and Fisheries, Pig Keeping Publications, London.]

PLATE 47 (Fig. 5).

Portable pig shed photographed on an English farm. A convenient type for Queensland conditions.

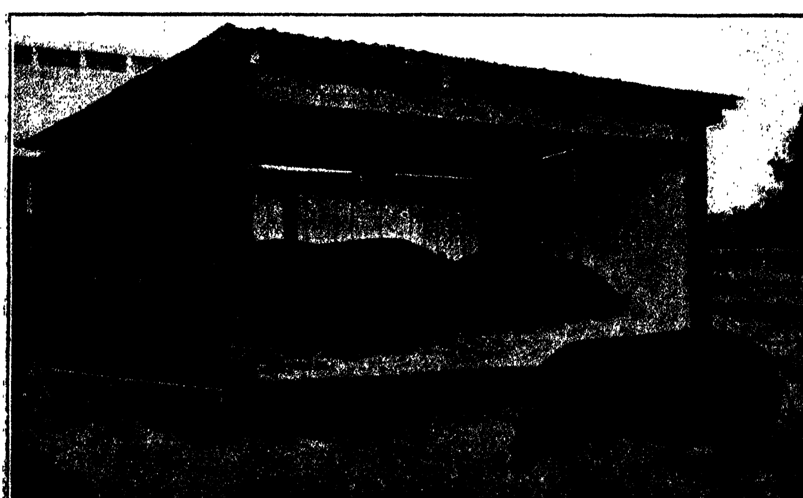


PLATE 48 (Fig. 6).

An open-fronted shelter shed which suits Queensland conditions.

It is advisable in planning pig-houses to so arrange walls and doors as to have direct sun rays into every part of the floor where practicable, and for this reason, the open-fronted shed faced to the north-east can well be recommended. In some particularly wet districts, however, it may be necessary to have the front of the shed partly closed in to prevent drifting rains from wetting the sleeping floor.

In selecting materials for building pig-houses, the costs of various suitable materials will largely influence their choice, but in general corrugated galvanised iron roofs, wooden walls, and floors of concrete and wood or wood alone will be found most satisfactory.

Single Sheds and Portable Sheds.

When the single shed is to be used in pig paddocks (see Figs. 4, 5, and 6), the best method of building it is to put it on runners, that will serve a double purpose of keeping the floor boards up off the ground and also the runners can be used as skids; thus the shed is portable, and could be hauled about the farm with a team of horses or a tractor. This practice has many advantages, and, for most Queensland pig raisers, this type of single portable house will be found the most serviceable.

Plate 49 (Fig. 7).

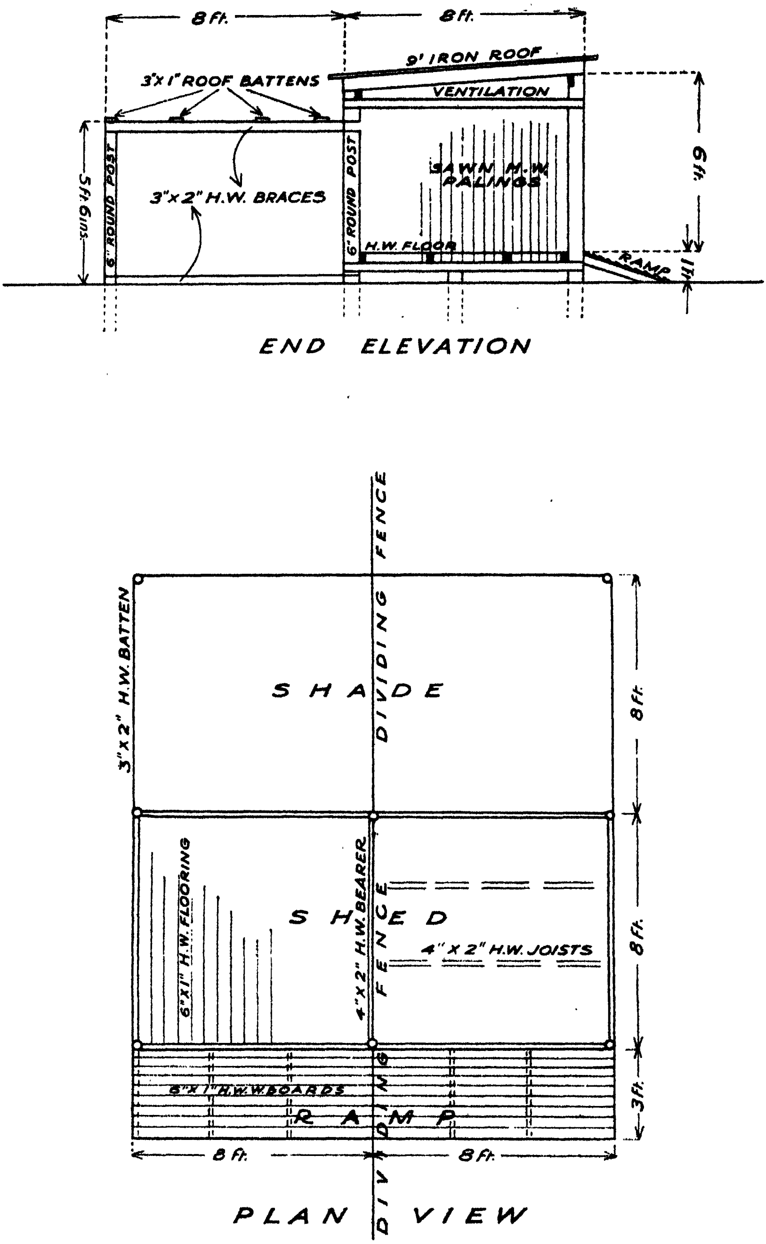
Double Pig Shed, divided by fence, at the Hawkesbury Agricultural College, Richmond, N.S.W. Note also the well-constructed fences and shade trees for comfort of stock.

Portable houses can be moved from one paddock to another when crops are being grazed off by pigs, and the shed can easily be removed from one part of a paddock to another in order to sweeten up the ground or to allow cultivators to work.

Double Shed.

This type of shed, as shown in Figs. 7 and 8, is very useful under the paddock system; it is easily constructed and, where the paddocks are large, there is no necessity for special drains with this shed; this also applies to the smaller single sheds. If it is necessary at any time to lock pigs in the open-fronted shed, a temporary hurdle can easily be erected along the front.

Pig-houses with wooden floors should have the floors built from 6 to 12 inches off the ground in order to keep them dry, and so that the ground under the floors may be kept sanitary.



OPEN FRONTED SHELTER SHEDS FOR PIGS
Being a Double Shed with a Dividing Fence
Ramp in Front and Brush Shade at Back
Plate 50 (Fig. 8).

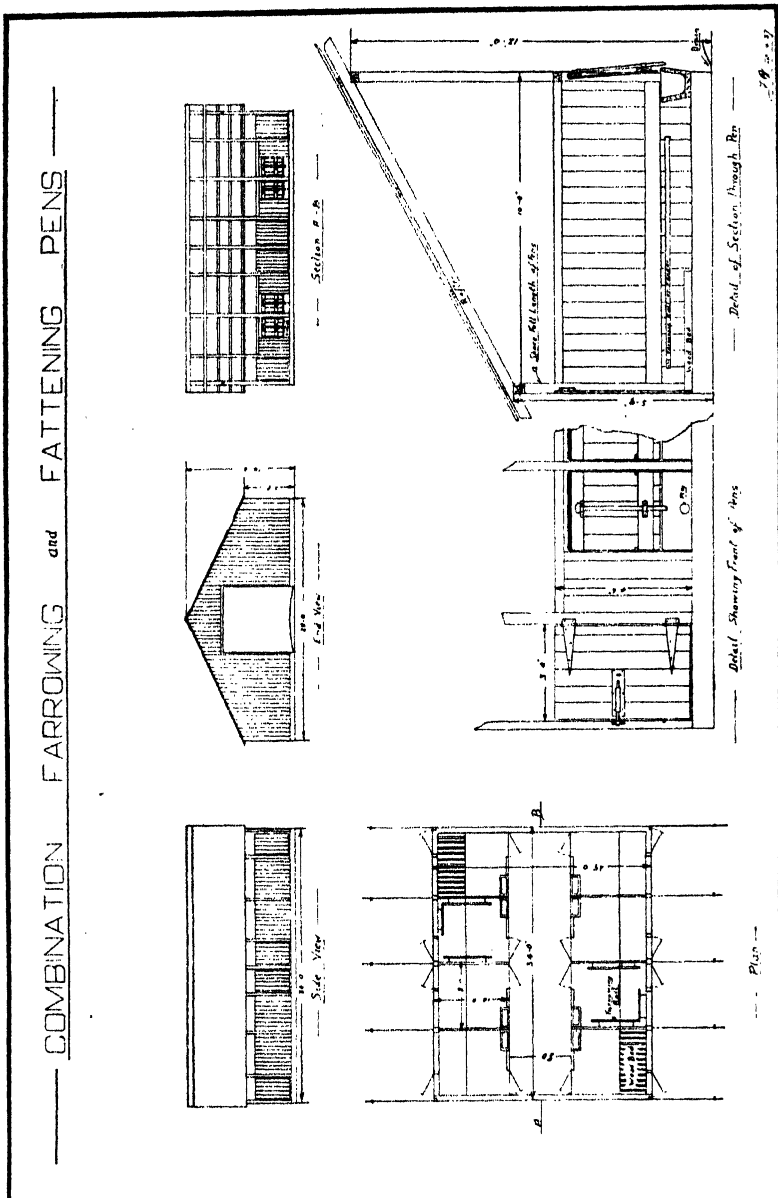


Plate 51 (Fig. 9).

This type of Piggery is suitable for suburban farms with a good water supply.

By Courtesy of Buzacott's Ltd.]

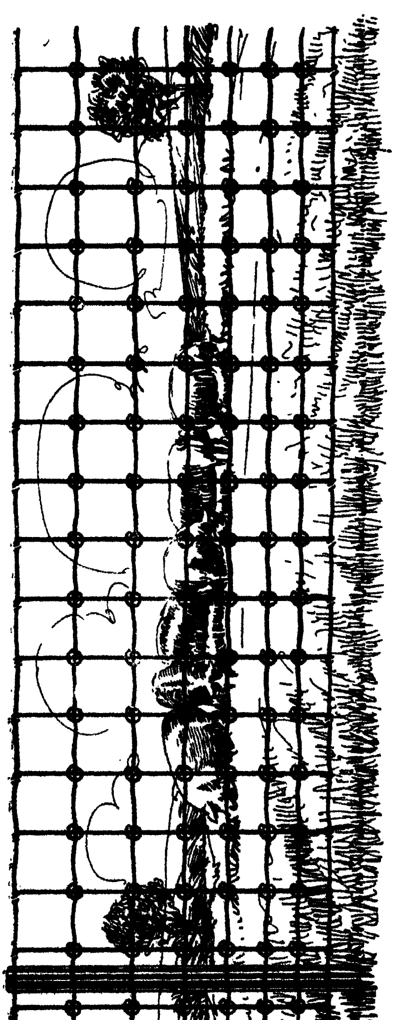
Plate 52 (Fig. 10).

Hinged joint woven-wire, 32 inches high.

Central Pig-Houses.

These are found to be most suitable for butter-milk piggeries, slaughter-house piggeries, and suburban piggeries. Fig. 9 illustrates this class of building, which is of a more solid and permanent structure than small individual houses. In this type of pig-house where large numbers of pigs are to be fed, impervious floors, preferably of concrete with wooden sleeping platforms, are essential. There should be a sanitary drainage system, and all drains should be shallow, smooth, and free from corners, and open to the sunlight; also the drainage must be delivered away to where it will not cause a nuisance.

In the large central pig-houses where there is continual dampness around the feeding troughs, the use of concrete walls is very beneficial, as they withstand the moisture much better than do wooden walls.



By Courtesy of Queensland Pastoral Supplies, Ltd.]

PLATE 53 (Fig. 11).

Ringknot Woven-wire Pig Fence (8 lines), 30 inches high.

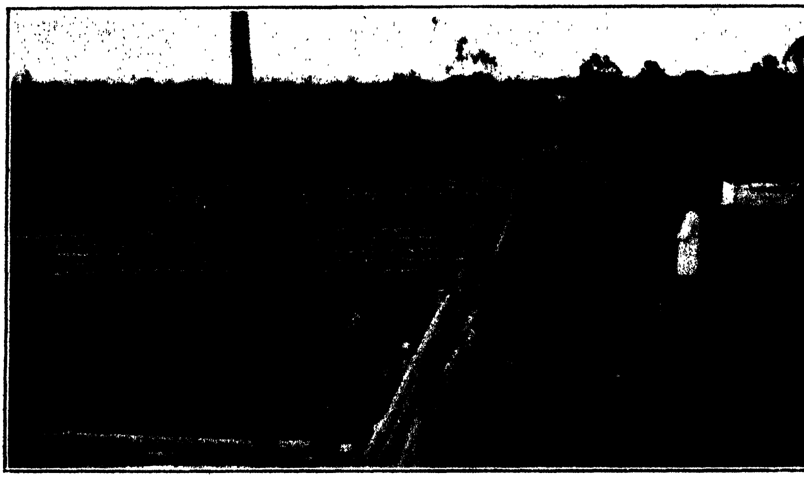


PLATE 54 (Fig. 12).

Straight saplings can be put to good use in pig fencing.

PLATE 55 (Fig. 13).

Another durable pig fence.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-inch by 2-inch hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

FENCES.

The class of fence to be used on each farm will be governed mainly by the available material for its construction.

Pig fences need to be from 2 feet 6 inches to 4 feet in height, depending on the class of pigs to be enclosed. Large boars and sows sometimes have a tendency to jump fences, and for such animals a 4-foot fence would be necessary; however, a fence 3 feet high is usually sufficient to control pigs of all sizes, while young pigs are usually kept in their places by 2-feet 6-inch fences. To overcome this difference in the required heights of fences, posts should be 4 feet out of the ground so that the height of the fence may be raised to 4 feet, if necessary, by the use of extra barbed wires.

With pig pens, it is a fairly constant rule that the smaller the pen the more substantial the fences must be, the reverse also holds. It is usually advisable to have a line of barbed wire, either on the ground level or a few inches below to prevent pigs from rooting under fences; logs or stones can sometimes be used for the same purpose.

The panels of pig fences should never be more than 10 feet, and 8 feet would be better. Several types of fences are satisfactory under certain conditions.

Perhaps the most satisfactory fence for pig paddocks is woven wire, which can be purchased at reasonable prices from hardware stores. Woven wire is made in various designs and especially for pig paddocks. The height of woven pig wire is about 2 feet 6 inches; this is sufficient for young stock, and if it is desired to increase the height of the fence, extra barbed wires may be placed above the woven wire.

Post-and-rail fences are most serviceable for large pigs, and can be made proof against small pigs by the addition of wire netting 18 inches high. This fence, however, is only suitable where timber is available cheaply.

Posts and wire netting alone seldom make a good fence except for weaner pigs, as the wire sags and is easily torn by large pigs. However, wire netting of stout gauge is useful in reinforcing other fences, such as ordinary cattle fences, to make them pig-proof.

The post and two-rail fence covered with split or sawn palings is suitable for some piggeries. The palings should be strapped on with hoop iron at the top and bottom. As is the case with all wooden fences, there is a danger of fire and white ants. The paling fence has the advantage of acting as a break-wind in the piggery.

The other type of paling fence (see Fig. 13), where either sawn or split palings are used and are held in position between two interwoven plain wires at the top and bottom of the posts, is very common and very useful where timber is plentiful. Saplings or slabs may also be used in the same way, interwoven with two wires top and bottom.

A fence made of seven barbed wires suitably placed on the posts is satisfactory for adult pigs, but it is objectionable where young pigs are penned, as a scratch from barbed wire shows up as a disfiguration on the carcass.

Where wire fences are used it is advisable to either reinforce them or replace them by wood at the feeding end of the paddocks as there is most wear and tear on this part of the fence.

TROUGHS.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time—that is, sufficient space should be provided at the trough for each pig; an average space of 10 inches should be allowed for adult pigs. The troughs should have the capacity to hold a full feed for the pigs.

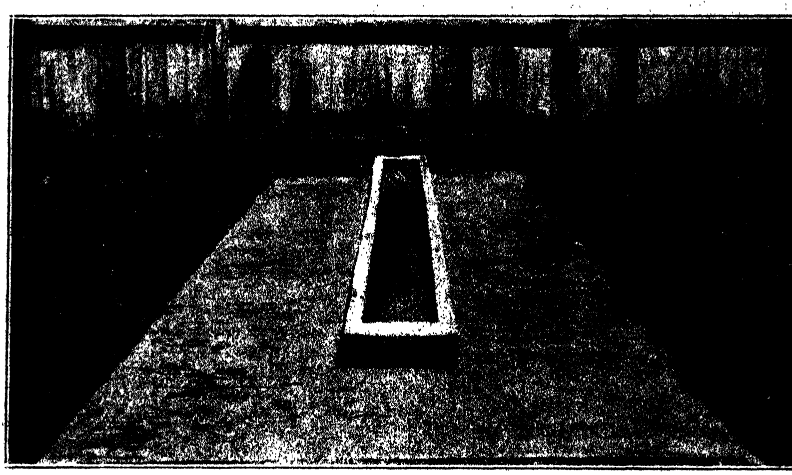


PLATE 56 (Fig. 14).

Concrete food trough and platform.

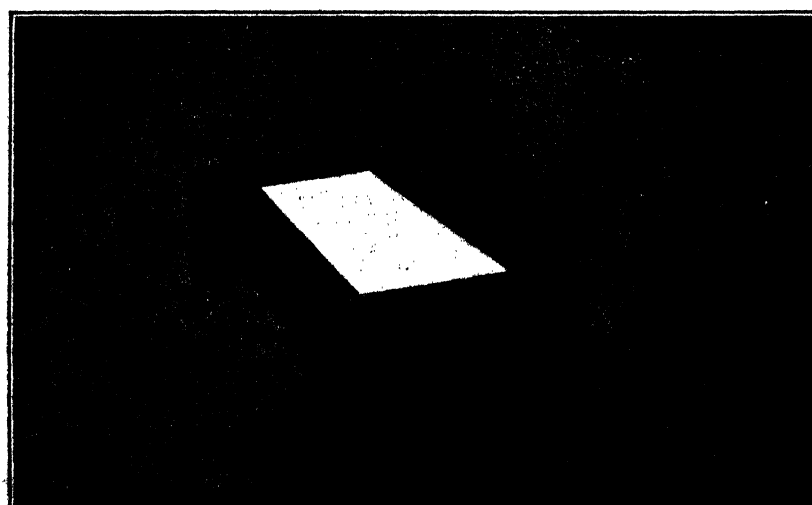


PLATE 57 (Fig. 15).

Breakfast is served. A handy V-shaped wooden trough.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made they should be of a size which allows of their being easily carried on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete brick or timber to prevent the pigs from making an objectionable mud wallow beside the trough. Wooden slabs placed on the ground beside the feeding trough are very unsanitary, even if they do keep the pigs out of the mud. Spilt food and drainage collects under the slabs and causes an objectionable odour. The feeding floor should always be of an impervious nature.

The most serviceable troughs are of concrete built into a concrete floor as shown in Figs. 14 and 17.

The trough illustrated in Fig. 14 is 14 feet in length and the width is 15 inches overall, having its sides of 2½-inch thickness, reinforced with barbed wire, lengthways. The trough is 5 inches deep and the inside width is 10 inches. The platform is 7 feet wide and 16 feet long and 4 inches in thickness, and is surrounded by a protective flange 4 by 2-inch hardwood, bolted together at the corners to protect the edges of the platform from being broken away.

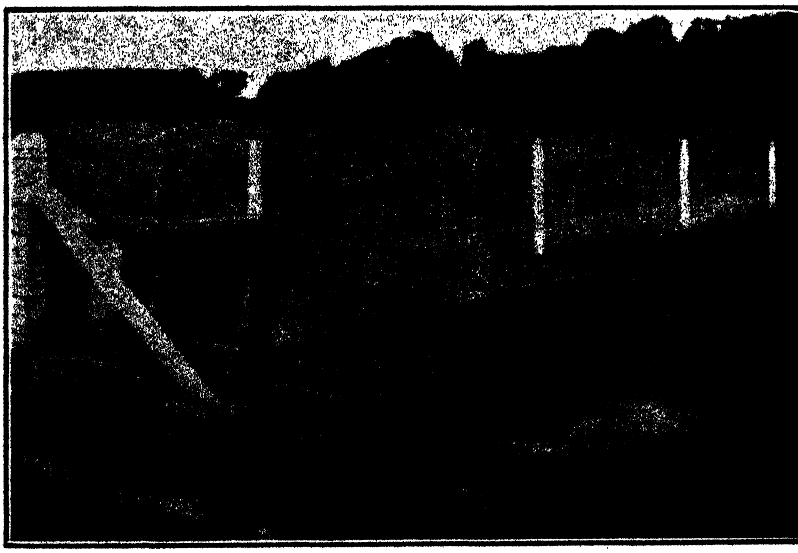


Plate 58 (Fig. 16).

A Woven Wire Pig Fence.—Note the wooden creep for feeding young pigs apart from the sow. This creep is so constructed that the suckers can get into the feeding pen, but the sow is blocked out; this permits of the suckers being fed a little extra food prior to weaning.

Improvements could be made to such a trough by having a bung in the end leading outside the pen to facilitate cleaning the trough. Also, if the end of the trough projects outside the fence, food could be poured in from the outside. Iron bars of ½-inch thickness set into the concrete across the trough 10 inches apart prevent the pigs from fighting at the trough and also prevent pigs from rooting food out of the trough. In such a trough it is preferable to have all the internal corners rounded off in order to facilitate cleaning.

The V-shaped wooden trough, as illustrated in Fig. 15, is very useful when concrete cannot be used. This type of trough can be made of varying sizes to suit requirements. One suited to general use is made of a 9-inch by 1-inch hardwood board and an 8-inch by 1-inch hardwood board secured by screwing or nailing together at right angles, and the ends closed up by 9-inch by 1-inch boards. The

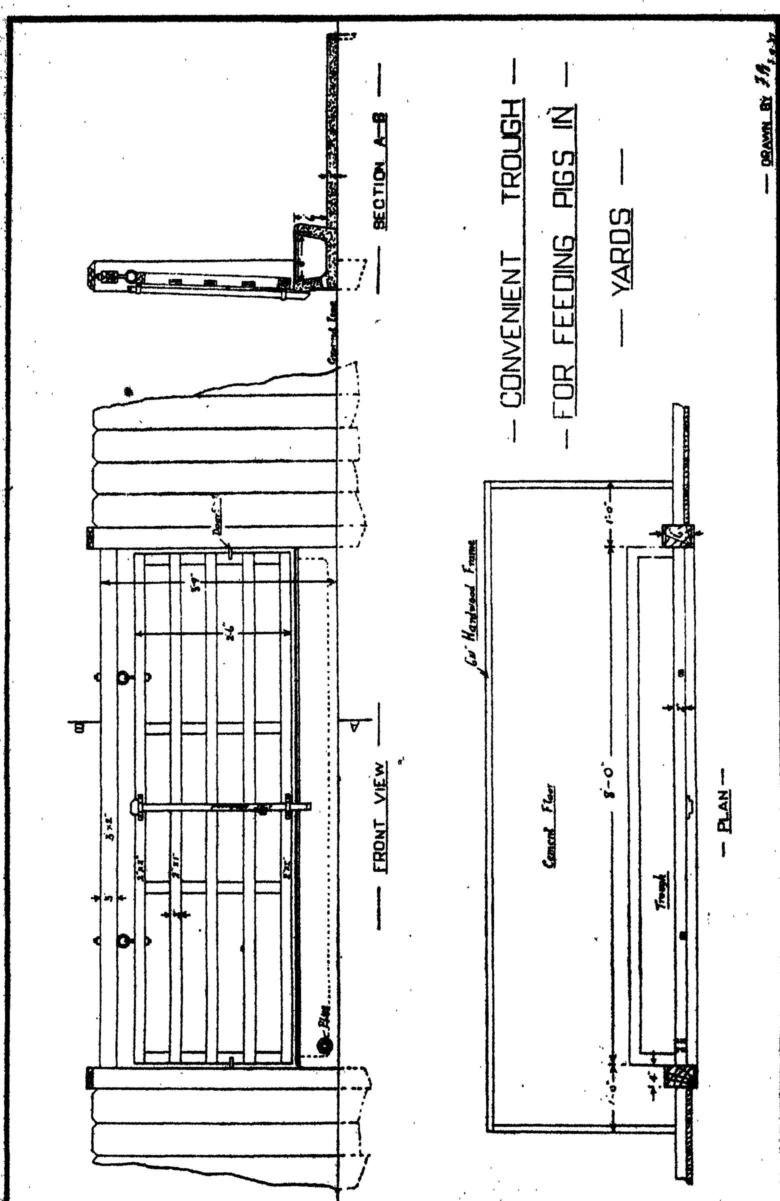


PLATE 59 (Fig. 17).

timber must be sawn and tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood, and also makes it watertight and more hygienic. Such a trough built on a movable wooden platform is most convenient for paddock use.

Cast and galvanised iron troughs of various designs are procurable from hardware stores, and these are satisfactory under certain conditions.

SELF-FEEDERS.

Self-feeding of pigs is as yet little practised in Australia, mainly because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig raising must be considered from a somewhat different viewpoint.

Plate 60 (Fig. 18).

Baconers grown on the self-feeder in which was placed a mixture containing 80 lb. maize meal, 10 lb. lucerne chaff, and 10 lb. meat meal. The pigs were also given unlimited supplies of water to drink.

The grain grower who keeps pigs, but has no milk foods, can make good use of his grain by feeding it in combination with such feeds as lucerne chaff and meat meal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry feeding through a self-feeder whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves.

Under certain conditions self-feeding has many advantages and is worthy of further trial.

Figs. 18 and 19 illustrate a type of self-feeder which has given satisfactory results in practice.

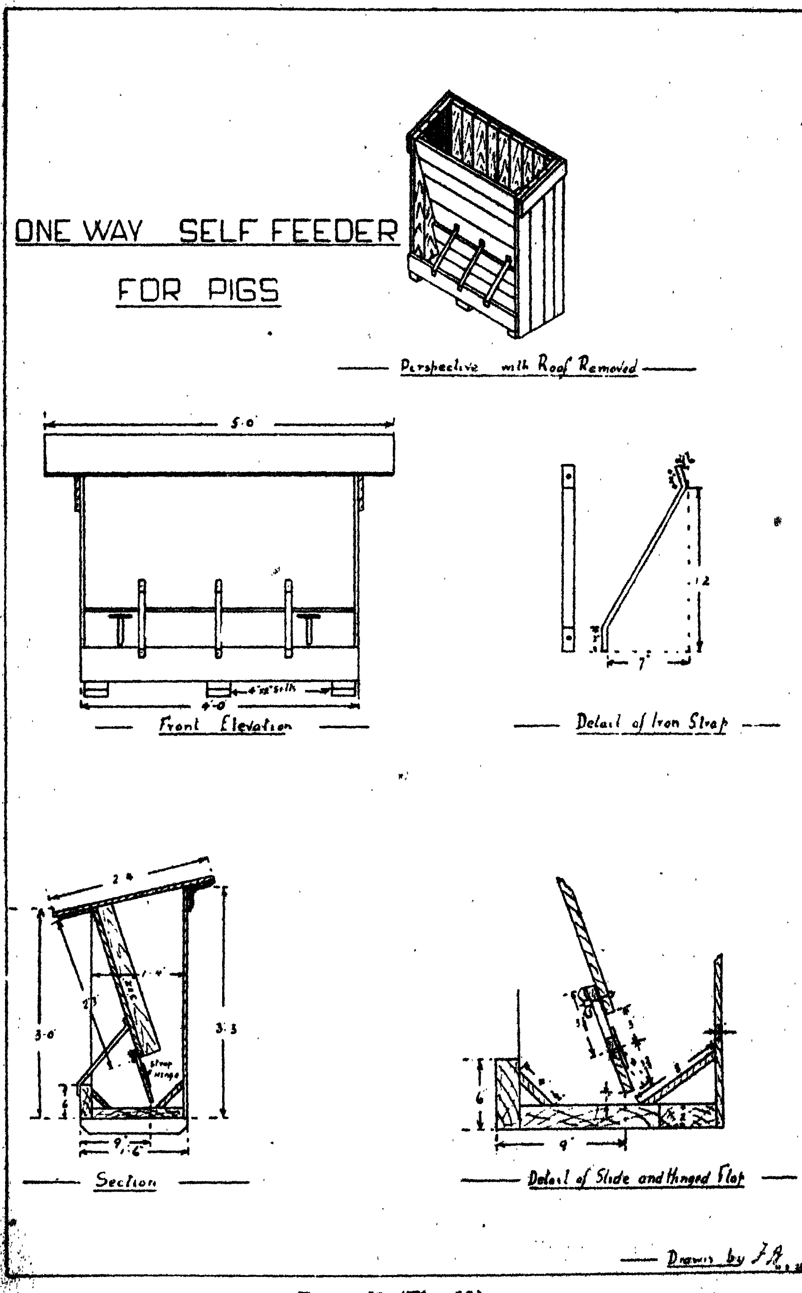


PLATE 61 (Fig. 19).

One-way Self-feeder for Pigs—Material Required.

(Plate 61, Fig. 19.)

Members.	Number.	Length.	Size.	Material.
Skids	Three ..	1 ft. 6 in. ..	4 in. x 2 in. ..	Hardwood
Trough	One ..	4 ft. ..	6 in. x 2 in. ..	Pine
Trough	One ..	3 ft. 10½ in.	12 in. x 2 in. ..	Pine
Trough	One ..	3 ft. 10½ in.	4 in. x 2 in. ..	Pine
Trough	One ..	3 ft. 10½ in.	8 in. x ¾ in. ..	Pine
Trough	One ..	3 ft. 10½ in.	4 in. x ¾ in. ..	Pine
Front Panels	Five ..	3 ft. 10½ in.	6 in. x ¾ in., T. & G.	Pine
Front Panels	Two ..	2 ft. 3 in. ..	3 in. x 2 in. ..	Pine
Sliding and Hinged Flaps	Two ..	3 ft. 10½ in.	4 in. x ¾ in. ..	Pine
Ends and Back	Twenty-four	3 ft. 3 in. ..	6 in. x ¾ in., T. & G.	Pine
Ends and Back	One ..	7 ft. ..	6 in. x ¾ in. ..	Pine
Top	Ten ..	2 ft. 4 in. ..	6 in. x ¾ in., T. & G.	Pine
Top	Two ..	5 ft. ..	6 in. x ¾ in. ..	Pine

Hardware.

Three 1-inch by ¼-inch iron straps.

Six 3-inch strap hinges.

Two 3-inch by ½-inch bolts with thumb nuts.

Nails, &c.

Plate 62 (Fig. 20).

Pig yards well shaded and sheltered with pepperina trees.

Shade.

Pigs should be provided with ample cool shade in hot summer months, and this can be done either by planting shrubs or hedges or by building a framework of 3-inch by 2-inch hardwood and covering the top with bushes or thatching it with grass. Where a clump of natural scrub can be left in the pig paddock, good shade is provided where the pigs can burrow away into the cool and find comfort during the hottest part of the day.

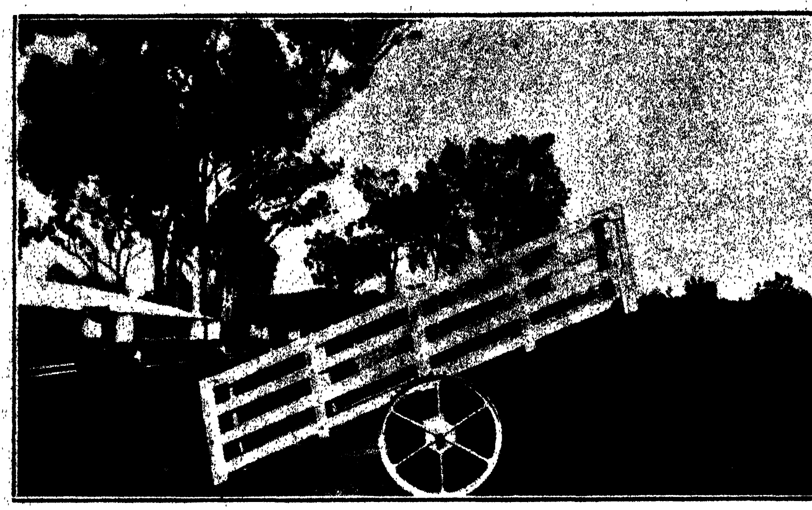


PLATE 63 (Fig. 21).

A useful portable loading race.

PLATE 64 (Fig. 22).

A well constructed and serviceable pig shed and run used by two Queensland Pig Club boys.

Oiling Post.

An occasional application of oil to the pig's skin keeps it in soft and healthy condition, and at the same time the oil destroys lice and other external parasites on the pig. A convenient self-oiler can be made by wrapping a bag or a rope round a post or a tree in the run from the ground level up to a height of 2 feet, the bagging or rope is kept saturated with oil, and the pigs oil themselves by rubbing against the post. A mixture of six parts of waste oil and one part of kerosene is suitable for oiling pigs.

Weighing Pigs.

As both pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price paid per lb. varies according to specified weight limits, it is important to the pig raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

PLATE 65 (Fig. 23).

A wooden crate suitable for weighing pigs. Note the strong construction, "slide-up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Softwood should be used in the construction of the crate so that its weight will not be too great.

On account of pig trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in very many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice, guessing the weight of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use they will soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

The crate should be light, yet strong; a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide (inside measurements).

If the weighing crate is arranged in a race, the pigs can be brought from their yard, weighed, and then returned to the yard conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig raisers. Special platform scales with a pig crate built on can be purchased at prices around £50, but at such a price their use must be limited to very large piggeries and trucking yards where large numbers of pigs are weighed.

PLATE 66 (Fig. 24).

Crate in position, ready for use with front door closed. Note the arrangement of the top beam, lever, and spring balance.

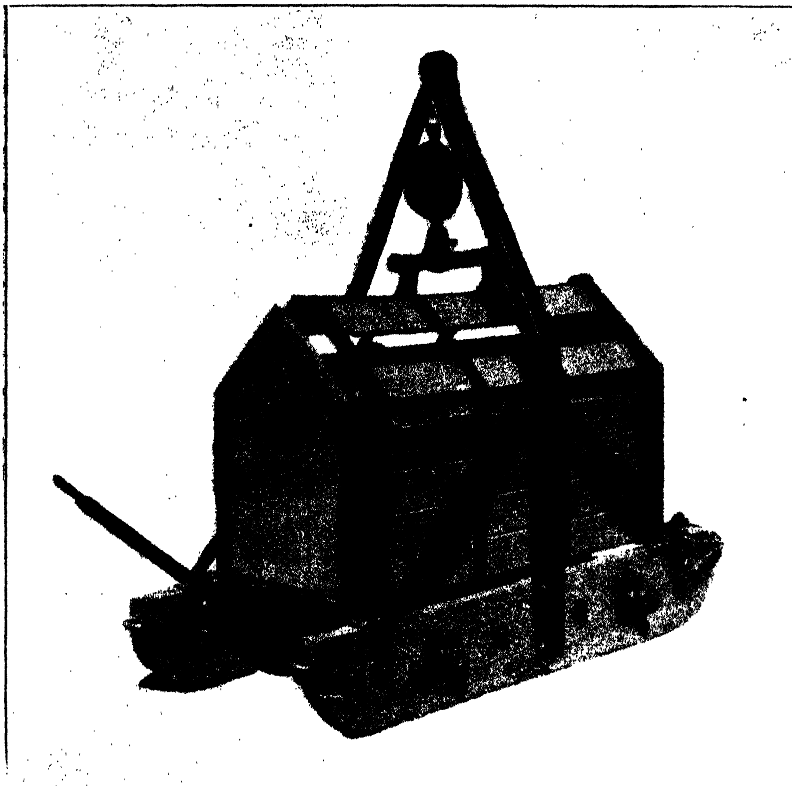


Plate 67 (Fig. 25).

A movable weighing appliance for porkers and baconers, designed, constructed, and patented by the Forster Engineering Works of Brisbane. This weigher has been in use at numerous Pig Club shows in Queensland and has proved satisfactory. It is built on two skid runners; the iron lever on the side enables the crate to be suspended, putting the weight on to the spring balance which is hung on the top of the frame. The sliding bar below the balance allows the operator to adjust the balance if the pig stands at one end of the crate. The doors at both ends of the crate slide up at the top so that the pig may walk in at one end and out at the other.

Cattle at the Brisbane Show.

LAST YEAR'S CHAMPIONS.

PLATE 68.
Champion Polled Hereford Cow, "Lovely II." (S. A. Plant, Cooyar.)

PLATE 69.
Champion Polled Hereford Bull, "Explorer." (S. A. Plant, Cooyar.)

Plate 70.
Champion Guernsey Cow, "Caramana Dolly." (Mr. Ben Gillespie, Springsure.)

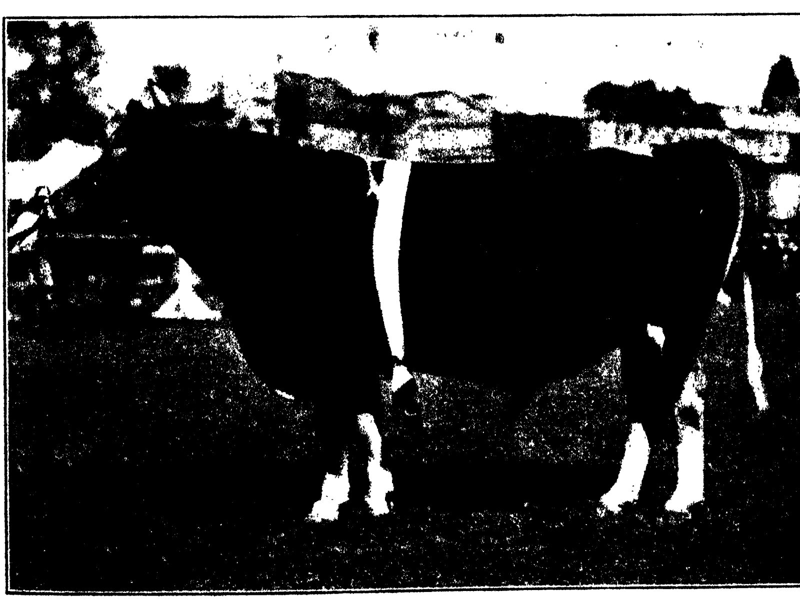


Plate 71.
Champion Guernsey Bull, "Tanto Golden Victor." (Mr. H. Nethercott.)

PLATE 72.
Champion Friesian Cow, "College Princess Pontiac." (W. Hickey and Sons.)

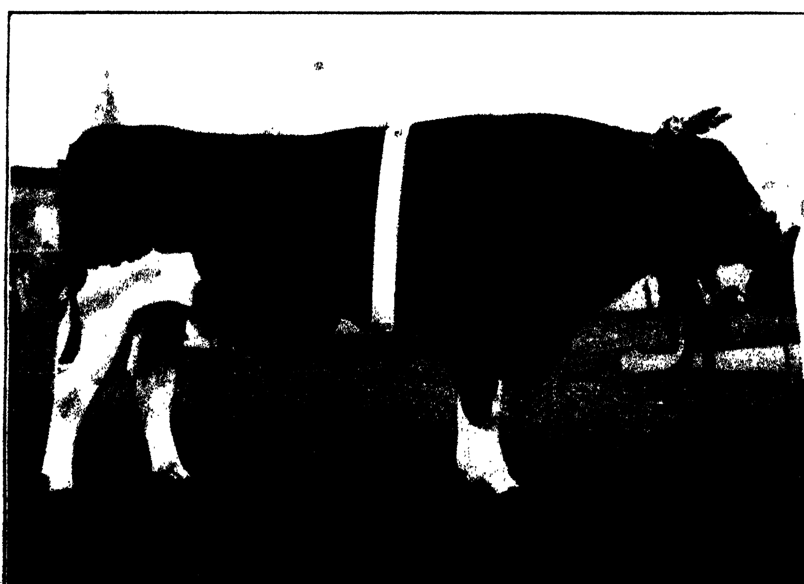


PLATE 73.
Champion Friesian Bull, "St. Atthan's Actuary." (W. H. Grams, Upper Tent Hill, Gatton.)

PLATE 74.
Champion Devon Heifer, "Lusty, 419." (R. A. Howell, South Killarney.)

PLATE 75.
Champion Devon Bull, "Baronet." (R. A. Howell, South Killarney.)

PLATE 76.—LADY ROSE OF GINDIE XII.
Awarded First Prize in the Beef Shorthorn Heifer Class six and under twelve months old. Exhibited by the Department of Agriculture and Stock.

PLATE 77.—GINDIE MASTER STROKE VI.
Awarded Second Prize in the Beef Shorthorn Class for a bull six and under twelve months old. Exhibited by the Department of Agriculture and Stock.

Plate 78.
Champion Polled Hereford Cow, "Lovely II.," with Calf. (S. A. Plant, Cooyar.)

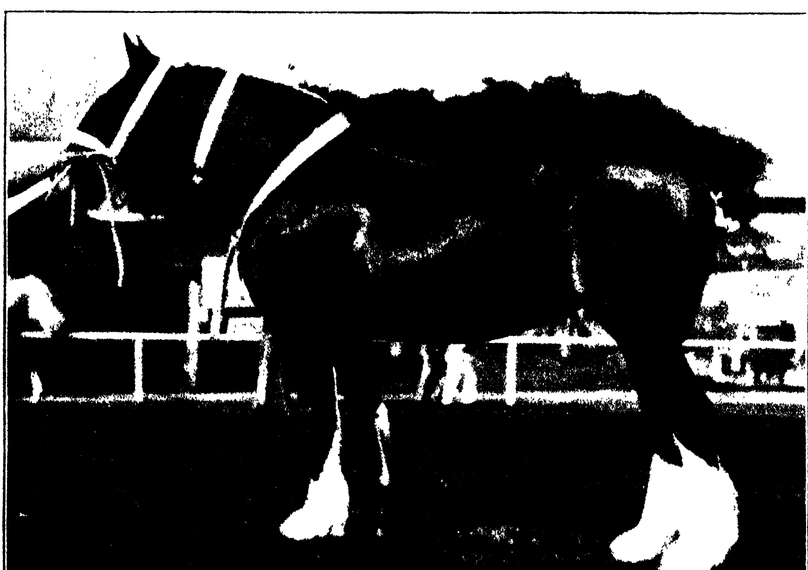


Plate 79.
Champion Clydesdale Mare, "Jean Dale." (A. T. Creswick, St. Helen's.)

PLATE 80.

"Lady Dorothy of Calton" (4496) by "Sultane's Victor of Brooklands" (1057), dam "Lady Lass 4th" (993). Winner of the Martin Snelling special prize at the 1931 Brisbane Royal National for pure-bred cow producing the greatest quantity of butter-fat in 273 days (all breeds). She produced 12,009 lb. of milk and 649·86 lb. fat in that period, beating three Australian Illawarra Shorthorns and a Friesian in the class. Lady Dorothy is a seven-year-old cow, and was bred and is owned by Mr. John Collins, of Calton, Tingoora.

DAIRYING IN QUEENSLAND—I.

By C. F. McGRATH, Supervisor of Dairying.*

IN my review of the 1930-1931 period it was said that the season had been a propitious one for the production of dairy produce and that the output was the largest in the history of the State.

At the opening of the period now reviewed climatic conditions were most encouraging, and favoured with early spring rains and the fact that the dairy herds generally had wintered well, an increase in production over the previous peak year was considered attainable.

During the first six months of the year a plentiful supply of grass and fodder crops was available for the dairy herds. Such favourable conditions were reflected in the output of butter and cheese during the six months ending December, 1931, which showed butter, 45,347,618 lb.; cheese, 6,325,163 lb.

As the result of a heat wave of unprecedented severity the pastures and fodder crops suffered serious damage, resulting in a marked decline in the output from the dairy farms.

Beneficial rains fell in the early autumn improving the prospects for the early winter period. Mild weather was experienced up to mid-June.

During the period reviewed the industry has made great progress throughout the dairying districts of Queensland, an outstanding feature of which is the development of the industry in the northern portions of this State. On the Tablelands and on the rich rain forest alluvial soils on the coastal belts development is proceeding along modern and efficient lines, as is reflected in the high quality of butter submitted from this area for export, 98 per cent. of which was choice and first.

Consignments of butter submitted for export by the factories of our northern tableland were not excelled by the products of any other portion of the State.

Statistics show that there has been a continuous increase in the output of butter during the past five years, as particularised:—

	Quantity.	Value.
	Lb.	£
1927	59,978,181	5,024,957
1928	71,162,096	5,633,666
1929	74,790,973	6,232,581
1930	87,554,244	5,902,096
1931	97,602,853	6,303,517

The quantity of butter exported during the past year approximates 73,000,000 lb. compared with approximately 71,000,000 lb. over the season 1930-31, representing a value of, approximately, £4,000,000 in the credit of the State's trade balance.

The output ot butter over the period of five years represents a total of 391,088,347 lb., for a value of £29,096,817.

Great Importance of the Industry.

Dairy farming and pig raising occupies a position as one of the State's most progressive and important branches of primary production.

There are about 23,000 families deriving their living from the dairy farms, some thousands are engaged in the producing, manufacturing, handling, and marketing of dairy products, while the industry sets in motion and sustains many other activities, industrial and commercial, as exemplified in the many rural centres dotted throughout the dairying areas.

The sum invested in dairy farms, including stock, amounts to, approximately, £37,000,000.

There are fifty co-operative butter factories and four proprietary butter factories, as well as fifty-nine cheese factories in Queensland.

* In an address at the Annual Conference of the Queensland Butter and Cheese Factory Managers' Association, June, 1932.

The amount invested in butter factory buildings and plant represents a value of £1,696,408.

The average output per factory during the year was 14.5 tons weekly or 766.8 tons yearly, which compares favourably with any dairying country in the world.

The birth and development of the dairying industry in this State was encompassed within the lifetime of many members of the Association, who give evidence of a vitality that will enable them to give many more years of useful service to the industry.

A Pleasant Retrospect—An Impressive Prospect.

It is most pleasing to review the history of the industry in this State as it is compiled of chapter succeeding chapter recording substantial progress not alone in the volume and value of output, but also along lines of efficiency, thereby assuring the future advancement and stability of the industry.

In centres of rural activities up-to-date dairy factories have been erected and equipped with the most modern plant known to the dairy world.

The modern dairy factory stands as amonument of the progress and stability not only of the industry, but also of the business and general commercial activities associated with the district in which it operates.

The agricultural development of a district and its future prospects are definitely and most reliably reflected in the activities of its central co-operative dairy factory. Many hundreds of written and personal inquiries from land seekers are dealt with yearly by the dairy branch of the Department of Agriculture and Stock, all desiring definite information as to the location and operations of the dairy factories. The factory stands as a beacon light to the land seeker. The output of a factory is the barometer of land values and also of the stability of general trading and commercial activities in its neighbourhood.

The success of our primary industries, of which dairy farming is such an important section, is essential in the progress of the Commonwealth and the prosperity of its people.

The dairy farmer contributes largely to the revenue of the State and the Commonwealth. By exporting 4,000,000 lb. worth of dairy produce overseas he makes a valuable contribution to the State's exports.

There is room for a vast expansion of the industry in the State with its millions of acres of fertile lands still undeveloped.

If the future holds opportunities there is no reason why the output of dairy products should not double within a period of ten years, thereby greatly increasing the volume and value of our overseas exports and materially strengthening the State's overseas credit.

QUALITY OF THE PRODUCT.

Grading.

I feel sure that there is no need for me to explain the meaning of this word to members of the Association, and I do not think there is another word in the English language that has a greater significance to-day for the dairy farmers and other primary producers than grading. Grading applies to so many other phases of primary producing activities that it would take some time to enumerate them all. I propose to deal with the finished product (butter), as delivered by our modern butter factories for home consumption and for export.

In modern dairy practice grading is an outstanding necessity whether applied to the producing, manufacturing, or to the marketing end. Neglect to carry out this essential activity would check the development of the industry along efficient lines and would end in its failure.

The examination, classification, and recording of defects in the finished product supplies the information necessary to investigate the source of defects through the producing, manufacturing, and marketing operations. Such investigatory work is essential to ascertain the causes that give rise to defects and locate those responsible, so that loss may be eliminated and permanent and lasting improvement achieved.

The chief characteristics which determine the grade of butter is its taste, aroma, flavour, body, and texture. Taste is the sensation given when the butter is taken into the mouth. It is often used as synonymous with flavour. It will assist the grader if he will confine the term taste to the sensations which are confined to the

mouth such as sweet, sour, salt, and bitter tastes. The term flavour combines the sensation of taste with that of smell. Aroma or odour is determined by the nasal organs alone.

Source of Flavour and Aroma in Butter.

High-grade butter possesses a pleasing, appetising taste, flavour, and aroma.

The chemical composition of the cream from which the butter is produced imparts a characteristic taste and flavour. The primary taste, odour, or flavour of a high-grade butter is on occasions supplemented by certain secondary tastes—flavours or odours foreign to a high-grade product such as acid, or bitter tastes, or unclean feed, or absorbed flavours and odours.

The secondary flavour may be of a volatile, aromatic nature and may be more or less discernible in the odour given off by the butter, such as strong food and absorbed flavours.

There are also flavours which are referred to by graders as after taste, which leave an unfavourable taste on the palate after the butter has been held in the mouth for some time or after it leaves the mouth. Such secondary tastes include those which are added to the primary taste of butter and are not influenced by feed.

Body and Consistency (Texture) of Butter.

The varying degree in which milk fats are subject to crystallization is one of the most important factors determining the body of butter. The composition of the butter-fat directly influences the varying liability of the milk fats to crystallization while the composition of the milk fat is influenced by the qualities of the food eaten by the producing cows.

Butter makers are familiar with the variation in the body of butter manufactured due to seasonal and fodder influences. The butter produced in certain months has frequently what is known as a weak body, while the product of other periods is firmer in body.

It is found that when cows are depastured on immature grasses and fodders that the body of the butter produced is weak; and a firm, good body is associated with the butter when the pasturage advances in maturity.

Results of investigations definitely indicate that the composition of milk fat is predominantly influenced by the qualities of the food consumed.

Analysis of succulent immature grasses show that they have a high nitrogenous and a low cellulose content, so that cows running on pasturage in this state of growth receive far too much nitrogenous matter and far too little cellulose. When the pasturage is advanced in growth there is a decrease in the albumen and an increase in the cellulose, and the butter produced becomes firmer in body. The feeding of cellulose in the form of wheat straw when cattle are on immature pasturage should improve the butter.

It is noticeable that stock that are turned on to immature fodder crops will consume dry maize stalks, wheat straw, and old dry grass in their desire to obtain cellulose.

Colour.

Milk, cream, and milk fat varies in colour from a pale white to a golden yellow. The depth of colour depends upon (*a*) the breed of the cow, (*b*) the kind of feed consumed, and (*c*) the quantity of fat and solids present.

The yellow colour of milk is due to the presence of the pigment carotin. Carotin is readily soluble in fat and it combines with the fat of milk and imparts the typical pale or deeper yellow colour. The depth of colour depends upon the quantity of pigment present in the blood when the milk is secreted. The pigment carotin also imparts colours to the body fats of sheep, cattle, and pigs. The body fat of fat stock depastured in certain localities of the State where feeds are high in carotin are of a deep golden colour. Seasonal variation in the colour of butter is due to the close relationship between the nature of the feed and the colour of the milk fat. In spring and summer the green grass and herbage on which the cows are fed are high in the pigment carotin, and the spring butter is of a high colour. During the winter when the feeds are dry in some localities the butter is pale in colour.

The proportion of the carotin in the feed retained in the body of the animal varies in the class of animal, individual animals, and especially with breeds of dairy cattle. The Jersey and Guernsey produce fat possessing a deeper yellow colour than animals of other dairy breeds such as Holstein, Shorthorn, and Ayrshires. The pigment as it occurs in milk fat so far as is known is identical chemically with that found in the plant.

Organisation.

As an aftermath of the war the worst economic and industrial depression the world has ever known caused many nations to alter their fiscal policy, and most of the leading countries adopted a policy of protective tariffs, disorganising trading conditions that held sway for centuries. To stabilise the industry it is necessary to protect it against dumping and unrestricted competition in the wholesale and retail sections. The influence of organised marketing through the agency of butter and cheese boards and the Dairy Produce Export Control Board has made for the betterment and advancement of the industry. The organisation pertaining to production and the application of the Equalisation Scheme to the butter section have rendered signal service to the industry. Strenuous efforts are being made by the members of the Cheese Board and all sections of the associated bodies to bring about the application of the Paterson and an Equalisation Scheme to the cheese section throughout Australia.

I have dealt with the progress chiefly in the manufacturing division of the industry. Time will not permit of my dealing with other phases of the industry. However, instructional and investigatory work is carried out by specially trained officers in all sections of the industry.

Much has been accomplished, much remains to be done, and through sustained co-operation of factory directorates and staffs with Departmental officers much greater benefit will accrue to the industry.

Photo: J. Davies.]

PLATE 81.—A MODERN MARANOA DAIRY.

An interesting view on Mrs. Cressard's Dairy Farm, near Roma.

FRUIT CASE DESIGN AND CONSTRUCTION.

IN a note on maturity standards of citrus fruits in our last issue the dimensions of the Canadian standard case were given as 18 inches long, 10½ inches wide, and 11½ inches deep. This was an error. The dimensions of the width and depth should be reversed, reading 11½ inches wide and 10½ inches deep respectively.

Mr. J. H. Gregory, Instructor in Fruit Packing, in the course of his visits to orchards, has observed that many growers do not make their cases correctly, thereby making it harder to put up the standard packs required on the market. Another grave fault is the bad milling of some of the boxes, causing the sacrifice of the essential features which make a particular type of box a success. A particular instance of this is the standard box used for citrus fruits and apples. We often find that millers cut thick tops and bottoms for this box, thereby precluding any chance of the packer putting a correct bulge on the case without damage to the fruit. In the subjoined notes the correct internal dimensions of each case are given, together with a few remarks on the various features in the making up. Mr. Gregory does not give the length and breadth of boards, as these vary with the thickness of the ends of the case and the particular type of timber from which the case is milled.

AUSTRALIAN DUMP CASE.

(18 inches long by 8⅝ inches wide by 14¼ inches deep.)

Thickness of ends: Minimum, ¾ inch.

Thickness of sides: Minimum, $\frac{5}{16}$ inch.

Thickness of lid and bottom: ¼ inch.

Use 1¼ inch nails for sides, 1½ inch for tops and bottoms.

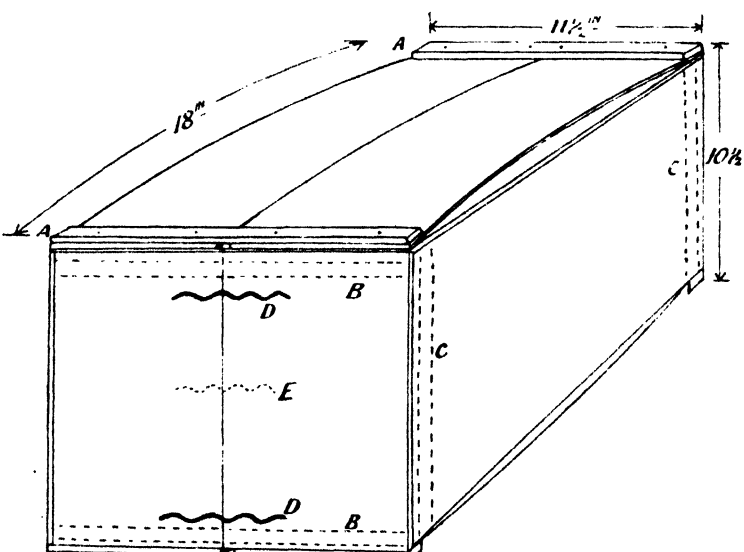


PLATE 82.—SKETCH OF CANADIAN STANDARD CASE.

LONG BUSHEL CASE.

(26 inches long by 6 inches wide by 14¼ inches deep clear of the partition.)

Thickness of ends and partition: Minimum, $\frac{11}{16}$ inch.

Thickness of sides, tops, and bottoms: Maximum, $\frac{5}{16}$ inch.

This case consists of two compartments, each 13 inches long by 6 inches wide by 14¼ inches deep.

CANADIAN STANDARD CASE.

(18 inches long by 11½ inches wide by 10½ inches deep.)

Thickness of ends: Minimum, ¾ inch.

Thickness of sides: Minimum, $\frac{5}{16}$ inch.

Thickness of tops and bottoms: $\frac{3}{16}$ inch.

Dimensions of cleats: 11½ inches long by ¾ inches wide by $\frac{3}{16}$ inch minimum thickness.

This case is made up with thin tops and bottoms to permit of a bulge of 1 inch to 1½ inches in height to be placed on the top and bottom of the case; the thin timber permits this bulge without damage to the fruit. The cleats are used to be placed across the ends of the lids and bottoms to strengthen the thin boards and assist in the prevention of splitting. The thick sides are necessary, as all cases are stacked on their sides when in transit.

Use 1¼ inch nails for sides and 1½ inch nails for tops and bottoms.

The cleats (A) are placed across the ends of the pieces of timber used for the tops and bottoms of the case, and are not used in the position indicated by the dotted lines (B and C). If growers are supplied with a case with two-piece ends, it is suggested that corrugated fasteners (D and E) be used instead of the cleats (B) indicated. Two fasteners (D) to join the two pieces should be placed on one side of the end about 1 inch from either edge (D) and one fastener (E) in the middle on the opposite side of the end.

TROPICAL FRUIT CASE.

(24¾ inches long by 12 inches wide by 12 inches deep.)

Ends: Minimum thickness, 1 inch.

Sides, tops, and bottoms: Minimum thickness, $\frac{5}{16}$ inch.

Use nails of minimum length of 1½ inches for making and nailing.

CALIFORNIAN CITRUS BOX.

(24 inches long by 11½ inches wide by 11½ inches deep, with partition.)
Used for Export overseas.

Ends and partition: Minimum thickness, ¾ inch.

Sides and bottoms: Minimum thickness, $\frac{5}{16}$ inch.

Top: ¼ inch thick, with cleats attached as on the standard box.

Cleats: 11½ inches long by ¾ inch wide by $\frac{3}{16}$ inch minimum thickness.

This case is made up of two compartments, 12 inches by 11½ inches by 11½ inches. Use 1½ inch nails for making and nailing.

ARROWROOT BOARD.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, vesting in the Arrowroot Board the ownership of all arrowroot bulbs grown and arrowroot flour manufactured in Queensland.

On 6th April last an Order in Council was issued giving notice of intention to make this Order and providing for a ballot of arrowroot growers and millers on the question.

The result of the voting was as follows:—

	Votes.
For the acquisition of arrowroot bulbs by the Arrowroot Board	81
Against	44
For the acquisition of arrowroot flour by the Arrowroot Board	82
Against	45

As the result was favourable, the necessary Order in Council has accordingly been issued.

THE BUFFALO FLY PEST.

MINISTERIAL STATEMENT.

THE Minister for Agriculture and Stock (Mr. F. W. Bulcock), in a recent statement, expressed his astonishment at the criticism levelled at the application of the policy of control adopted in this State to combat the extension of the buffalo fly pest, and deprecated the publication of protests against the methods adopted, which tend to hamper rather than assist the Department in its policy.

Prior to his assumption of office the Minister pointed out that suggestions had been made for the control of the pest—

(1) By the establishment of a buffer area to the south and east of the area then infested, and the removal of all stock therefrom;

(2) The regulation of stock movements from the infested area and the treatment of stock prior to entry into clean country; and

(3) Biological control, involving the introduction of a predatory insect to reduce the pest to a minimum.

The first suggestion was discarded by the late Government as impracticable, but biological research was undertaken by the Commonwealth Government and is in progress, with prospects of success.

In the meantime, however, the adoption of urgent measures for control was necessary, and a decision was arrived at to erect a spraying plant at Kajabbi to treat all cattle from the infested area, which extends in Queensland approximately as far easterly as the Flinders River, and southerly to the junction of the 19th parallel of latitude and the 140th degree of longitude. This spray was completed in May last, and certain preliminary tests made, as a result of which efficient spraying methods were provided for.

Spraying Travelling Stock.

The Minister arranged for the despatch of a veterinary surgeon and an entomologist to Kajabbi, and under their direction stock have been sprayed, and, with the co-operation of the Railway Department, have been despatched by rail from Kajabbi to the Townsville meatworks and markets. No difficulty whatever was experienced in handling these cattle in the spray. On the 17th June 511 head of lightly infested cattle were sprayed successfully and trucked expeditiously, and on the 27th June 411 head were similarly dealt with. The entomologist or veterinary surgeon accompanies the train for some distance to note the effect of the spray, and instructions have been issued to stock inspectors at Julia Creek, Hughenden, and Charters Towers to make further inspections en route. On arrival in Townsville a further inspection is made by an officer who has been despatched to that city for the purpose, and arrangements have been made for the veterinary surgeon at Townsville meatworks to also inspect the stock. The Railway Department co-operates in the thorough cleansing of trucks and the incineration of all excreta, and the trucks are effectively sprayed with a solution of borax to dispose of any fly larvæ.

Risk of Relaxing Restrictions.

Mr. Bulcock referred to the obvious danger attendant on any relaxation of the restrictions, which prohibit the movement of cattle on the hoof past Kajabbi. However, a concession has been granted which is consistent with the policy of effective control, and which will permit of the removal of cattle from Kajabbi which are not intended for the meatworks, but for movement to destinations south of the Great Northern Railway. These cattle may, after spraying, be trucked to Julia Creek or any station east thereof, or to Butru on the Dajarra Railway, when they may be untrucked and continue their journey on the hoof. The period of transit by rail would in these cases be sufficient for purposes of observation, and would preclude the possibility of the conveyance of the fly into these areas.

The Minister has instructed departmental officers detailed for supervision at Kajabbi to keep him in touch with all developments, and stockowners may be assured that no unnecessary hardship will be imposed, other than is consistent with the adoption of control measures considered essential under the circumstances.

Menace to the Dairying Industry.

Mr. Bulcock desired to remind the critics of the present control methods that, although it is the considered opinion of experts that the spread of the fly is governed by the incidence of rainfall and temperature, no concrete or convincing evidence has been adduced that the fly would not thrive in our coastal areas; on the contrary expert opinions have been expressed that conditions in those areas would be favourable for its propagation and extension. In this connection the Minister referred to

a statement made by Dr. R. J. Tillyard, Chief Entomologist of the Commonwealth Government and one of the leading entomological authorities in the Empire, who expressed a fear that if the pest reached the east coast of Queensland it would spread in a southerly direction to the Hunter River, in New South Wales, with disastrous results. The menace to the dairying industry of this State and New South Wales can, under such conditions, be viewed in its correct perspective by all unprejudiced persons who have the interest of that and other allied industries at heart.

In conclusion, the Minister emphasised the necessity for the adoption of a policy of "Safety First," and in applying that policy, by the introduction of the only practical methods at present available, he appealed to all sections of the community to withhold criticism of a parochial nature, and assist with practical sympathy and co-operation in dealing with the pest as a menace to the welfare of the State in general, and the dairying and pastoral industries in particular.

REPLY TO RECENT CRITICISM.

Replying recently to criticism of Departmental activities in the checking of the spread of the buffalo fly pest, the Minister (Mr. F. W. Bulcock) remarked that it was contended that existing regulations are harassing, and that it was suggested that cattle coming from the suspected areas should not have to comply with the same conditions as prescribed for cattle coming from infested areas. If these areas were suspected, it was quite obvious, he said, that it would be exceedingly unwise to treat the stock running on them as being free from the pest.

A reference to changing boundaries was really a tribute to the vigilance of the officers of his Department, who were endeavouring at all times to accommodate regulations to existing circumstances. Exception was taken to the fact that cattle consigned for spraying at Kajabbi were required to be trucked to either Julia Creek or Butru, a distance of 140 miles. The reason why this precaution was taken was also plain. Kajabbi was just south of the suspected area, and bearing in mind the fact that the buffalo fly had crossed to Mornington Island, in the Gulf of Carpentaria, it was reasonable to suppose that it could be carried conisderable distances on the mainland. The fact must not be lost sight of that the buffalo fly deposits its eggs in the excreta of cattle, and if stock were permitted to walk away from Kajabbi after treatment the whole effect of spraying and the attempt to preserve clean country would be defeated, because unquestionably it would afford successive stages to the buffalo fly on its progress east.

Mention was made of the stationing, only one stock inspector being at Normanton. This was true, but if any alleviation could be afforded by the transfer of another inspector to the district he was quite prepared to send another man along.

The assertion that the danger of the spread of the buffalo fly was over-estimated was not supported by fact. That the fly had been prevalent in the same country for many years was quite correct, but it was only fair to point out the additional fact that the buffalo fly was known in certain areas for fifty years, and never seemed to extend beyond those areas, and then magically it extended east and rapidly enveloped huge areas of cattle country.

In order to make the spraying plant at Kajabbi more efficient, Mr. Bulcock recently authorised the expenditure of a considerable sum of money. He has instructed Veterinary Surgeon Ohman, who is at present at Kajabbi, to make an extensive survey of the whole buffalo fly position in the Gulf country, so that Departmental policy for next year could be framed on the basis of inflicting the least possible hardship on those who are unfortunate enough to be running cattle in suspected or fly-infested districts.

It was entirely wrong, Mr. Bulcock continued, to say that stockowners in the infested country are required to bear the full cost of treatment. As a matter of fact, the only cost borne by the producer is the cost of spraying, which has been reduced to 6d. a head. The organisation has to be maintained both in infested and in clean country, and men are employed at contact points in order to prevent the spreading of the fly east. The general body of stockowners, therefore, were making a liberal contribution towards their own security and freedom from buffalo fly. It was obvious that the buffalo fly should be prevented from spreading further east. It was also clear that once the fly established itself on our coastal country that the dairying industry would be faced with the prospect of enormous losses both of stock and production, and as it was one of the premier industries of the State it was plain that it must be preserved to the State.

The provision of additional spraying facilities at another point would possibly give further relief, and that would be considered when planning next year's control programme.

GRAIN FEEDING OF SHEEP.

NOTES ON NEW ZEALAND TRIALS.*

IN connection with this work, five different mobs of lambs and two mobs of old ewes were fed on wheat and grass, and three other mobs of lambs were fed—one each on rape, peas, and barley. The number of mobs used is not enough to arrive at any conclusion about grain feeding, nor are the trials extended over a sufficiently long period of the year for this purpose. There are good reasons for supposing that, from the point of view of getting good returns from fattening sheep, the best time of the year would be from the end of December till the middle of March, while the weather is warm and the grass capable of growing fast and abundantly in normal seasons. From the point of view of keeping sheep in health (breeding ewes), grain should give results in winter and early spring, when there is not enough grass and when something better than chaff and hard feed is necessary to bring ewes, in lamb or with lambs, along in good condition. There are, however, many possibilities that should be investigated.

LAMBS.

First Trial (100 Lambs).

These lambs began to feed on 30th January on fair grass. Sixty-five went away fat on 24th February and thirty-two on 18th March; two died and three are left that will not fatten this year. They ate 21 bushels of wheat and gave a total live weight increase of 977 lb. Forty-three per cent. of this is carcass, equal to 440 lb., and this, at 8d. per lb., is worth 3,520 pence. The total feeding time was equal to 31 days for all the lambs, or 450 lamb weeks. Charging up the grazing at 2d. per head, wheat returned 10s. 4d. per bushel; or, at 3d. per head per week, 9s. 4d. per bushel. The lambs ate .40 lb. per head per day of wheat and put on .31 lb. per head live weight.

Neglecting the live weight increase and basing our calculations on the sales of lambs only, 100 lambs fed on wheat returned 248s. more than 100 other of the same original mob that were not fed on wheat on this farm. This amount of money can be credited to the 21 bushels of wheat used, and makes the return for wheat 11s. 10d. per bushel—a close approximation to the returns otherwise calculated.

Second Trial.

On this farm three lots of lambs were fed as follows:—

Mob A.—Fifty-two light lambs, bought stores, started feeding 3rd February; finished 16th April. Increase in live weight, 14.8 lb. per head, equal to .21 lb. per lamb per day. Nineteen of them sold as fats. Nineteen bushels of wheat were eaten, equal to about 17 lb. per lamb, or about .25 lb. per head per day. The value of live weight increase equals 43 per cent. of 790 lb. at 8d. per lb.—i.e., 2,720 pence. The value of 528 lamb weeks of grazing, at 2d. per week, is 1,056 pence, leaving 1,664 pence for 19 bushels of wheat, or 7s. 3d. per bushel; at 3d. per head per week for the grazing, the wheat returned 4s. 7d. per bushel.

Mob B.—Seventy light lambs from the same mob grazed for 37 days, from 10th March, and put on 10 lb. live weight. Sixteen were sold fat on 13th April. They ate ¼ lb. wheat per day, and by the same calculations as before, these lambs returned 13s. 8d. per bushel for wheat when grazing is worth 2d. per head per week, and 11s. 11d. when grazing is worth 3d. per head per week.

Mob C.—Forty heavy lambs from the same mob as the above were grazed for 63 days, from 11th March. They put on 7.6 lb. in the time, and 27 of them went away fat by 13th April. They ate the same quantity of wheat per head as the first mob, and, by the same calculation, gave a return of 2s. 11d. per bushel when grazing is 2d. per head per week, and no return at all when grazing is 3d. per head per week.

Third Trial.

Four mobs of lambs at Lincoln College (one on wheat):—

Mob A (Wheat).—Thirty-one fair store lambs were fed from 18th February for seven weeks, and put on 10¾ lb. of live weight in that time. They ate 11 bushels of wheat at the rate of .45 lb. per head per day. When grazing is worth 2d. per head per week, wheat returns 5s. 6d. per bushel; at 3d. per head per week for grazing, 4s. 1d. per bushel.

* From the final report on trials carried out by the Department of Animal Nutrition, Canterbury (N.Z.) Agricultural College, in conjunction with New Zealand Wheatgrowers' Co-operative Association, Limited.

Mob B (*Peas*).—Thirty-one lambs from the same mob, fed over the same period on peas, put on 10½ lb. They ate 0.71 lb. peas per head per day, and returned 3s. 8d. per bushel when grazing is worth 2d. per head per week, or 2s. 7d. when grazing is worth 3d. per head per week.

Mob C (*Barley*).—Thirty-one lambs, as above, fed over the same period on barley, put on 9 lb. They ate .41 lb. of barley per head per day, and returned 4s. per bushel when grazing is worth 2d. per head, and 2s. 8d. per bushel when grazing is worth 3d. per head.

Mob D (*Rape*).—Thirty-five lambs, as above, fed over the same period on rape, put on 9¾ lb. and ate 2 acres of an average rape crop. This mob provides an interesting side line on the quality of lamb used in this experiment, and the general futility of trying to fatten at a profit store lambs that have been allowed to go back. These lambs, although on good rape during good fattening weather, grew at the rate of only .20 lb. per head per day, whereas lambs that are profitably fattened usually put on about .40 lb. per day. Although the rate of growth is low, and the returns obtained are poor on both rape and grass with grain, the lambs have, in general, done better on grass and grain than they have on rape. In view of the dominant position of rape as a fattening crop, it is of very great importance to find that here is a type of feeding—grain and grass—that has produced unmistakably better results than rape.

Summary of Result Obtained with Lambs.

Number of Lambs.	Amount eaten per day, lb. per head.	Rate of gain per head per day, lbs.	Return per Bushel after Paying for Grass at: 2d. per head per week.	3d. per head per week.
			s. d.	s. d.
100	·40	·31	10 4	9 4
52	·25	·21	7 3	4 7
70	·25	·28	13 8	11 1
40	·25	·12	2 11	..
31	·45	·21	5 6	2 1
Peas— 31	·70	·21	3 8	2 7
Barley— 31	·40	·18	4 0	2 8
Rape— 31	..	·20	..	..

So far we have taken the attitude that grain feeding is possible only when the returns obtained more than pay for the cost of feed used. In the writer's opinion there is no doubt that payable returns would be obtained always when grain is used with good lambs and good grass. From these trials, which confirm a very general opinion, it would appear that there is little profit to be obtained from feeding stock that has been abused, no matter what kind of feed is used. This class of stock has to be fed and fattened, however, and in the season just past it could be fed more cheaply with grain and grass than with rape.

In the above feeding trials the amounts of grain eaten per lamb were 20 lb., 18 lb., 10 lb., 16 lb., 20 lb., 32 lb. peas, 16 lb. barley, and it will be seen that, except for peas no feeding cost more than 2s. per head, even when wheat costs 6s. per bushel. Feeding costs never amount to more than 3½d. per head per week, and this, along with the grass charge of 2d. per head per week, is less than the price paid for rape.

OLD EWES.

Old ewes should prove quite a good market for wheat, and in order to get some information on the subject, three trials were carried out, two with wheat and one without.

Mob A (Without Wheat).

Forty old ewes on pea and wheat stubble gave an average increase in live weight of 8.4 lb. per head in the first 27 days and lost 0.2 lb. per head in the last 22 days. On these figures, the returns in live weight from grass only are such that grazing was worth 2d. per head per week.

Mob B (With Wheat and Grass).

Eighty old ewes from the same mob gave an average live weight increase of 9.2 lb. in the first 27 days and 1.8 lb. in the last three weeks, a total of 11 lb. in seven weeks. They ate 39 bushels of wheat, and when grazing is worth 2d. per head per week, the return per bushel of wheat is 13 pence.

Mob C (With Wheat and Grass).

Seventy old ewes gave an average live weight increase of 11.6 lb. in 42 days. They ate 33 bushels of wheat, and with grazing at 2d. per head per week, the return for wheat used is 16½ pence per bushel.

On these returns it has not been profitable to feed wheat to these old ewes, but in all probability this trial was left till too late, when there was not enough grass. The low value per pound (3½d.) is a serious handicap as far as getting good returns from grain is concerned. The disposal of old ewes is, however, a many sided question, and early sales, made possible by feeding grain before the lambs are weaned, may have values that are not readily shown in cash. More information is wanted on the question.

WHEAT BREEDING INVESTIGATION.

ARRANGEMENTS have been made by the Minister for Agriculture, Mr. Frank Bulcock, for Mr. Richard E. Soutter, Departmental Wheat Breeder and Manager of the State Farm at Bungeworgorai to make an extended tour of the chief wheat-growing regions of Australia, in the course of which he will visit Canberra and all of the mainland States. The tour is planned to afford Mr. Soutter an opportunity of conferring with other wheat breeders and observing the results of scientific wheat breeding as carried out at the principal research stations and experimental farms in the Commonwealth.

Mr. Soutter's Career.

Mr. Soutter, who is a Yorkshireman by birth, came to Queensland in early boyhood and has been associated with land interests all his working life. His father, Mr. William Soutter, who has achieved great distinction as a horticulturist, was the first to raise seedling pineapples and sugar-cane in Queensland. Specialising in horticulture, Mr. Soutter, junior, was for four years instructor in propagation at the Queensland Acclimatisation Society's gardens, near Brisbane. He was subsequently appointed to the staff of the Queensland Agricultural College at Gatton. Some time later he was transferred to the State farm at Westbrook, where he took charge of the orchard and vineyard. From Westbrook Mr. Soutter went to Roma, where he established Departmental plant-breeding plots, and when the State farm at Bungeworgorai was formed he was appointed manager, a position he has held for the past twenty-six years. All that time he has been engaged in wheat-breeding work, the results of which have proved of inestimable value to the Queensland wheatgrowers.

Mr. Soutter has made valuable contributions towards the solution of the problem of rust infestation, which renders many of the wheats popularly grown in other States unsuitable for Queensland conditions. Many of the varieties bred by Mr. Soutter have proved definitely rust escaping, and have produced good yields of grain in seasons when the yield of other varieties has been adversely affected by the prevalence of rust.

The proportion of Queensland-bred wheats grown in this State is increasing largely as a result of his efforts and the efforts of those associated with him in this very important work. Among the most prominent kinds evolved in Queensland are Amby, Bunge No. 1, Beewar, Cedric, Duke of York, Flora, Novo, Three Seas, Warchief, Soutter's Early, and Watchman; with the exception of the two first named these were evolved by Mr. Soutter at Bungeworgorai.

Queensland offers advantages for considerable expansion of its wheat-growing industry. Suitable land is comparatively cheap here, and the average yield per acre over the past ten-year period is higher than for any other State of the Commonwealth, with the exception of Tasmania. Those facts have influenced Mr. Bulcock to a large extent in shaping future agricultural policy, and much benefit to wheatgrowers, and to the State generally, should accrue from the results of Mr. Soutter's important mission.

Answers to Correspondents.

Broad-Leaved Fuchsia.

H.H.C. (Dajarra)—

The specimen is Broad-leaved Fuchsia (*Eremophila maculata*). This plant is poisonous to stock, as it contains a prussic acid yielding glucoside. In spite of this fact paddock stock at times seem to eat large quantities of the plant without any ill effects following. Travelling stock, however, or stock coming on to it on an empty stomach, very often succumb quickly, and large losses have occurred in this way.

Groundsel.

F.T. (Ross Creek, via Gympie)—

The specimen is the Groundsel Bush (*Baccharis halimifolia*), a native of South America that has now overrun much country in coastal Queensland. It seems to prefer salt water flats, bordering creeks and rivers, but is by no means confined to such situations, and of late years has spread extensively into a good deal of scrub country. With a strong-growing plant such as this we rather doubt the efficacy of ordinary weed sprays, and grubbing out, though expensive, seems to be the only satisfactory means of eradication. If you wanted to try a spray that is non-poisonous to stock, you could use "Weedex," containing calcium chlorate at, say, about a 5 per cent. solution. This substance may be obtained from A.C.F. and Shirleys Limited at a price of 12s. 6d. for 42 lb. Though stock have been grazed without ill effects in paddocks where weeds have been sprayed with "Weedex," they should not be allowed to gain access to tins containing the concentrate or unused spray.

Poisonous Plant *(Cestrum Parqui)*.

E.J.P. (Brisbane)—

The specimen is *Cestrum Parqui*, a native of South America, now quite common as a naturalised weed about Brisbane. The plant is poisonous, and several cases of stock poisoning by it in the neighbourhood of Brisbane are on record. We have not heard a common name applied to it.

Sorghum fulvum.

Inquirer (Brisbane)—

The specimen is *Sorghum fulvum*, a large coarse native grass, forming a fair quantity of feed for cattle. It is very common in North Queensland, but we have not heard a common name applied to it.

Tick Trefoil and Clover.

W.H.C. (East Malanda)—The specimens were as follows:—

1. *Desmodium triflorum*, a species of Tick Trefoil. This is a small legume widely spread over the tropical regions of the world, and of late years has very much increased in Queensland pastures. There is no doubt that it is a valuable leguminous fodder, but it grows rather close to the ground to provide much feed for stock.

2. As far as we can say from leaves only this is ordinary White Dutch Clover (*Trifolium repens*). We cannot give any reason for the non-flowering of this plant except that your locality may be too hot. It is very difficult to tell clovers in the absence of flower heads, but we have compared your specimen with all the common clovers cultivated here, and it seems to agree best with the White Dutch, as stated.

Poisonous Plants.

L.A.B. (Bauple)—The specimens have been determined as follows:—

1. *Trema aspera*, the Peach Leaf Poison Bush or Poison Peach. This plant has a bad reputation as a poisonous plant in different parts of Queensland and New South Wales. At times it develops a prussic acid yielding glucoside,

but the formation of this is rather erratic. We have seen cattle eat the plant in very large quantities on many occasions without ill effects following, and rather doubt whether it deserves the extremely poisonous reputation given it by many people.

2. *Solanum torvum*, very common in parts of the Wide Bay and Burnett districts, and generally known as Devil's Fig. It belongs to a dangerous family, and the green berries may cause trouble if eaten by stock. Birds, however, apparently eat them with impunity.
3. *Solanum Seaforthianum*, generally known in Queensland as Deadly Nightshade. It is a tropical American plant, now a naturalised weed in many parts of Queensland, especially in parts of the Wide Bay district, where it has overrun much of the fallen scrub land. The plant is definitely poisonous to stock, and if plant poisoning is the cause of your trouble we are inclined to suspect this one. Children have been made violently ill from eating the berries, but birds are apparently unaffected by them, because the plant is spread by them from one locality to another.

Rubber Vine.

"INQUIRER," Capella.—

The specimen is as you suspect the Rubber Vine, *Cryptostegia grandiflora*. The properties of the plant are not known, but it belongs to a dangerous family —the *Asclepiadaceæ*—and we should think that if any part of the plant were chewed by children it would make them very ill. The plant has proved itself a pest in some parts of North Queensland, having strayed from garden culture along river flats, &c., where it makes a bad tangle—very difficult if not impossible to ride through.

General Notes.

Queensland Maize Pool.

Executive approval has been given to the issue of a notice of intention to make an Order in Council under the Primary Producers' Organisation and Marketing Acts, constituting a Queensland Maize Board.

Maize growers who at any time after 1st March, 1931, harvested for sale maize (grain) grown in Queensland (except on the Atherton Tableland) or who have growing at the present time maize intended for sale, may petition for a poll to decide whether the Pool shall be created. Such petition must be signed by at least fifty growers as above, and must be lodged at the Department of Agriculture and Stock before 5 p.m. on 8th August, 1932.

The proposed Order in Council will declare all maize produced for sale and harvested in any part of Queensland other than the Petty Sessions Districts of Atherton, Herberton, and Chillagoe, and also all maize of previous seasons produced for sale and which at the date of the Order in Council is the property of and in possession of the grower, to be a commodity under the abovementioned Acts for a period of three years from 1st March, 1932.

There will be constituted a Maize Board consisting of six elected representatives and the Director of Marketing. Two members each shall be elected to represent Districts No. 1 (Moreton), No. 2 (Darling Downs and Maranoa), and No. 3 (comprising the whole of Queensland except Districts Nos. 1 and 2 and the Petty Sessions Districts of Atherton, Herberton, and Chillagoe). These members shall hold office throughout the term of the Board—that is, until 28th February, 1935.

The persons who will be entitled to vote at any election or referendum will be—

(*a*) For the purpose of any poll taken before the Order in Council is made, and for the purpose of the first election of the elected representatives of the Board, all persons who at any time after 1st March, 1931, harvested for sale maize grown in any part of the State except the Petty Sessions Districts of Atherton, Herberton, and Chillagoe; or all persons who, on the date of voting, had growing in that part of Queensland excepting the Tableland maize intended for sale.

(b) For the purpose of any poll taken after the Order in Council is made, and for any subsequent election, all persons who at any time during the twelve months preceding the date of such poll or election harvested maize produced for sale within any part of the State except the Tableland and delivered their product to the Board for sale.

If the Order in Council is made, all maize which has been harvested shall become the property of the Pool Board, as also shall maize harvested between the date of the Order and the 28th February, 1935.

Staff Changes and Appointments.

Mr. Edmund Sutton, Fletcher, via Stanthorpe, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. J. Macfie has been appointed an Assistant Inspecting Cane Tester for the forthcoming sugar season, with headquarters at Cairns.

Mr. F. R. Dunn, Inspector of Stock, Winton, has been appointed District Inspector of Stock and Brands, Department of Agriculture and Stock, and will be stationed in the Cloncurry district.

Mr. T. W. Dunning, Audley End, Kilcoy, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Acting Sergeant T. M. Brannelly, Babinda, has been appointed also an Inspector under the Slaughtering Act.

Mr. Walter Blakey, of Ingham road, Townsville, has been appointed an Honorary Ranger under the Animals and Birds Acts, for the purposes of the Mount St. John Sanctuary, near Townsville.

Mr. W. E. Black has been appointed a Ranger under the Animals and Birds Acts.

The following have been appointed Cane Testers at the undermentioned sugar-mills for the duration of the crushing season:—P. H. Compton (Farleigh), Miss D. Marles (Fairymead), L. Chadwick (Bingera), T. D. Cullen (Isis), F. C. Jorss (Maryborough), J. Howard (Rocky Point), Miss O. Knight (Gin Gin), L. C. Home (Millaquin), and C. J. Boast (Moreton).

The following have been appointed Assistant Cane Testers at the undermentioned sugar-mills for the duration of the crushing season:—Mrs. M. C. Beatty (Plane Creek), Miss A. S. Mullin (Moreton), Miss E. M. Mullin (Maryborough), Miss A. Murray (Millaquin), Miss F. Payne (Moreton), and Miss S. Wilkinson (Bingera).

Mr. J. W. Inverarity, manager of the Kalamia Sugar Mill, has been appointed Millowners' Representative on the Kalamia Local Sugar Cane Prices Board, vice Mr. R. H. Farrar, deceased.

Mr. E. Irving, manager of the Goondi Sugar Mill, has been appointed Millowners' Representative on the Goondi Local Sugar Cane Prices Board, in the place of Mr. N. S. Beatty, who has resigned.

Canary Seed Production.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated recently that he had investigated the position of the canary seed industry, particularly with regard to Australia's requirements. The experience of growers shows that there are suitable conditions of soil and climate, particularly on the Darling Downs, for the production of this crop. Australia's requirements are around 1,500 tons a year, but because of the adverse season last year the yield fell to about 660 tons, and a quantity had to be imported. Under normal conditions there should be no necessity to import seed, and farmers, particularly those in districts suitable for growing the seed, are asked to do everything possible to supply all the needs of the Commonwealth market.

At present farmers have the benefit of a favourable tariff, but this may not continue unless Queensland growers show that they are prepared to increase production considerably.

Canary seed is one of those crops which can be planted over an extended period. and is less exacting in this regard than other winter growing cereals. Plantings right up to September have, under favourable conditions, resulted in good yields. In the last two years the Canary Seed Board has been able to return to growers about £26 a ton, net, for cleaned seed, and at this figure it should be an attractive crop to farmers who are suitably situated.

"I am in possession of first hand knowledge," continued Mr. Bulcock, "that merchants handling the seed in the South are somewhat anxious of the position, and are disposed to doubt the ability of the farmers of this State to grow sufficient canary seed to meet Australia's needs. I have given Southern firms an assurance that Queensland growers will satisfactorily meet the market requirements, and it is now for the growers to do their part, and I feel confident that the assurance given will be honoured."

Mr. Edmund Jowett on How to Remove Depression and Unemployment.

At a public meeting held by the Monetary Reform Movement in Melbourne on 5th July, Mr. Edmund Jowett said that he had always been a strong opponent of inflation and of any form of repudiation. But he was also fully alive to the gigantic evils of that policy of deflation which the world had been so diligently and ignorantly following during the last seven years.

That policy of deflation took the form of contracting the currencies and of limiting the purchasing powers of the people of the world in order to bring down the wholesale prices of commodities. So far as he could ascertain it was the work of about thirteen men, whom he would designate as philosophers. They were full of knowledge, and were wizards in finance. They were the high priests of the worship of the gold standard, and of the policy of deflation, which was the world's chief source of depression and unemployment.

Fortunately, however, as against the thirteen deflation philosophers a school of newer economists and statesmen had arisen in England who were now contesting the ground against the deflationists. He had a list of fourteen of them, men of great distinction, all of whom desired, and some of whom demanded, that the prices of the period 1926 to 1929 be restored.

This was a wise and humane attitude. It was expressed by Sir Basil Blackett, a director of the Bank of England, who had said, "The volume of money should be increased or decreased according to the amount needed to keep prices stable."

Mr. Jowett's advice to everyone in Australia was to turn a deaf ear to the followers of the thirteen high priests of deflation and desolation, and to support the doctrines of the fourteen newer economists.

Dairy Herd Improvement.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated recently that the Government had approved of a scheme having as its object the further improvement of the dairy herds of Queensland. In outlining the scheme, Mr. Bulcock said that a remarkable improvement had taken place in the breeding of the better class dairy cow following the introduction of the Dairy Cattle Improvement Subsidy Scheme (commonly known as the Better Bull Scheme) by Mr. Forgan Smith when Minister for Agriculture. This scheme, which was discontinued in 1930, gave a great impetus to the use of approved purebred sires, and was instrumental in bringing prominently before breeders of purebred stock the necessity of production recording.

With the decrease in cream values it is essential that dairy farmers should continue to improve their herds. At present dairying is one of the most important of our primary industries, contributing last year through the export trade approximately £4,000,000 to the credit of the State's trade balance. The foundation for the dairying industry of the future must be laid now in the breeding and rearing of high-class dairy stock.

With this object in view the Government has decided to grant a rebate of railway freight on approved purebred dairy sires to a maximum of £10.

It is essential that the dams of such sires shall have attained the standard of production required under the official Australian Purebred Production Recording Scheme. Such sires must be between the ages of one and six years, be registered or eligible for registration in a recognised herd book, and be certified free from disease.

Mr. Bulcock added that this rebate will apply in respect to freight within Queensland only.

Maize Importations.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated recently that it would be remembered that he had communicated with the Minister for Trade and Customs (Mr. J. A. Perkins) some few days ago, in respect to the importation of maize and maize by-products from overseas, and had protested against grain being

introduced into Australia until such time as supplies within Australia had been absorbed. He had received a reply, wherein he was advised that the existing import duty on maize, which is 3s. 6d. per cental (general tariff), plus 10 per cent. primage, will be continued. The protection to Australian growers is further assisted by the adverse exchange rate.

Agricultural Correspondence Courses.

After perusing recently the series of correspondence lessons, arranged by the Department of Agriculture and Stock for the benefit of young rural club members, the Minister, Mr. F. W. Bulcock, expressed the opinion that the course is an admirable one.

Though at present in its initial stages and largely experimental, the series of correspondence lessons in pig raising had, he added, been taken up enthusiastically by a number of junior farmers and by lads in course of training at the Salvation Army Farm at Riverview, Queensland. Writing of his opportunities, one of the correspondence course students, Mr. Robert Williams, states that "due in no small measure to the experience gained through this course of lessons, and to the fact that he has a determination to succeed, he has been placed in charge of an important stud of pigs, the property of a well-known business firm in Gympie (Messrs. Drummond and Parke, Limited), and already results are proving satisfactory."

There are, to the instructor's knowledge, said Mr. Bulcock, hundreds of young men in this State who, through lack of finance and opportunity, are unable to benefit by a course at an agricultural college. There are many more living at so great a distance from central training schools that attendance thereat is almost impossible: while there are others, graduates of the Home Projects Scheme, leaving or having left school, who would be prospective students of practical agricultural correspondence courses. The scheme, therefore, has a very fine objective, and in expressing his appreciation the Minister hoped the instructors would continue with the good work.

The officers principally concerned at present are Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, and Mr. L. A. Downey, H.D.A., his assistant, who acts as examiner of the students' work.

Wheat Board.

Executive approval has been given to an amendment of the State Wheat Pool Election Regulations, which will provide that the five wheatgrowers to be appointed to the Board from 1st September, 1932, shall hold office until the 31st August, 1933, only.

The regulations originally provided that Board members should be appointed for a period of two years, but as the Wheat Pool Acts have been extended to the 1932-1933 season only, the amendment has been found necessary.

Banana Marketing.

An amendment of the Fruit and Vegetable Grading and Packing Regulations, issued in pursuance of the provisions of "*The Fruit and Vegetables Act of* 1927," has received Executive approval to-day. This amendment provides that in the case of all varieties of bananas marketed in the bunch, the number of fruit in dozens (to the nearest half dozen) shall be legibly branded on the bunch stalk near the top end: Provided that in the case of Cavendish bananas the number of fruit in the bottom hand shall not be counted.

Tomato Marketing.

A regulation has been issued under the Fruit Marketing Organisation Acts which provides for a ballot to be taken on the question of the acquisition of tomatoes by the Committee of Direction of Fruit Marketing.

The Committee of Direction has acquired tomatoes for the past three years during the same period as is desired this year—namely, three months from the 15th September to the 15th December, and the system has met with the general approval of growers.

The districts to which the proposed acquisition shall apply may be roughly described as being those within an area bordered on the north by Rockhampton, on the west by Rosewood, and on the south by the New South Wales Border, and including the islands in Moreton Bay.

The ballot will be conducted by the C.O.D., and will close at noon on the 13th August, 1932.

Growers concerned for the purposes of the poll comprise all persons, not being persons engaged in the growing of tomatoes as employees on wages or piecework rates, who have, and who sign a declaration that they have, at the date of the poll, tomatoes growing in certain specified areas for market.

Canegrowers' Council.

The Queensland Cane Growers Council Regulations, issued under the Primary Producers' Organisation and Marketing Acts, have been amended, and additional regulations approved, which prescribe the fees, allowances, and travelling expenses payable to members of the Queensland Cane Growers' Council when they are required to attend any conference or deputation outside the State.

The fees, allowances, and travelling expenses payable to members of the various District Executives and Mill Suppliers' Committees are also provided for. Additionally, a member of a District Executive or Mill Suppliers' Committee attending as a delegate from a sugar-mill the annual sugar industry conference convened by the Queensland Cane Growers' Council, shall receive an allowance whilst sitting at the conference, together with a travelling allowance, and the reimbursement of all railway and other fares which are reasonably necessary and which are actually incurred.

Border Crossing at Goondiwindi.

An Order in Council has been issued under the Diseases in Stock Acts, appointing East Goondiwindi to be a crossing place for stock from the State of New South Wales. East Goondiwindi is situated three and a-half miles from the town of Goondiwindi, and is considered a much more suitable place, in all respects, than the present crossing place, which necessitates stock having to be travelled through the main thoroughfare at Goondiwindi.

Commercial Cane Sugar.

A Regulation under the Sugar Cane Prices Acts has been issued rescinding General Regulation No. 4, which was passed in February, 1916, regarding the methods of determination of commercial cane sugar in cane. The new Regulation aims at uniformity in the methods of making analysis by mills for payment purposes.

Since the original Regulation of 1916 was passed, conditions have altered so that the provision of sampling for three minutes is not practicable owing to the higher crushing rate. Again, the term "sucrose" now has a different meaning, and is replaced by the international term "Pol." With the added knowledge in the possession of the Central Sugar Cane Prices Board, it is considered advisable to lay down definite methods for determining the factors used in the calculation of commercial cane sugar, and particularly with regard to "fibre in cane," the method is set down in detail.

Provision is made in the Regulation for the accuracy of the instruments to be used in the determinations. The new Regulation amplifies generally the one which it rescinds.

Beekeeping Regulations.

Regulations to give full effect to the provisions of "*The Apiaries Act of 1931*" have received Executive approval. These Regulations prohibit the entry into Queensland of bees, bee combs, beeswax, second-hand hives, second-hand beekeepers' appliances, or honey, unless they are introduced at stated places of entry, and conform in all respects with the provisions of the Act and Regulations. Provision is made for the quarantining and treatment of diseased bees, and for the registration, in the prescribed form, of apiaries or hives. The fees for registration, or any renewal or transfer thereof, shall be—For an apiary consisting of 1 to 15 hives—2s. 6d.; 16 or more hives—5s.

Certificates of registration are issued and shall remain in force until 31st December of the year following the year of registration, but may be renewed thereafter in the same manner and for a like period as the original registration is made. Inspectors under the Act are given certain powers with regard to the inspection of apiaries, and for prescribing the treatment or destruction of diseased bees.

Silage as Stock Insurance.

A consideration that must weigh heavily in favour of silage is the insurance it offers against the loss of valuable cows during a hard winter or a drought. Dairy herds that have taken years to build up are worth a great deal, and the numbers

and the standard of a herd cannot be easily recovered when a drought ends. If losses occur periodically, the rate of improvement in the herd is very slow indeed, as the ground lost during one drought has probably hardly been regained when another period of scarcity comes along. It is the best cows that generally go off first if feed is scarce, as, owing to their high-producing disposition, they keep low in condition; while the poor yielders keep themselves in condition by using the feed to build up flesh and strength instead of making milk.

Points in Calf-Rearing.

In the rearing of calves it is important that they be fed separately. The practice of feeding in tubs or troughs must be strongly condemned, because it allows the fast drinkers to get too much milk at the expense of the slower ones. It also tends to make young animals drink faster than they should, which gives rise to digestive troubles. Slow drinking should be encouraged, because it allows the milk to combine in proper proportions with the saliva and assures thorough digestion. Proof of this is shown by the fact that slow drinkers always grow best, provided, of course, that they are given their full ration of milk. Moreover, it is impossible to cleanse a trough thoroughly, and as a consequence it is a common cause of scours—more particularly when made of wood or a hollow log.

Money is well spent in the erection of proper yards and bails for calf feeding, much time and temper being saved thereby. Too often there is an entire lack of convenience for this important work, which is carried out twice every day.—A. and P. Notes, N.S.W. Dept. Agric.

Australian Nuts.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock) in a recent Press interview stated that he had received a report from Mr. H. Barnes, Instructor in Fruit Culture, who had represented the Department at the recent conference of nut growers at Murwillumbah.

He was very pleased indeed, stated Mr. Bulcock, to note that the meeting had been such a success and that representatives of various phases of the industry had interested themselves sufficiently to be present, in some cases having journed long distances.

Now that the movement has been started in the right direction it appears very evident that much benefit will result to nut growers, and it behoves them all to become members of the new Nut Growers' Association which has been formed.

The conference was of special interest to growers and prospective growers of the Queensland nut (or the Australian nut, as the conference has decided it should be called, since the term "Australian nut" had a national significance and would be a good advertising medium overseas).

This nut was one of the finest grown anywhere in the world, and we were fortunate in that it was indigenous to the coastal districts of the southern parts of this State and to the northern districts of New South Wales. It was a hardy tree, and according to experiences related by growers at the conference could be grown and would thrive in quite a variety of soils.

The market prospects appear to be good. One exporter had received a report from principals in America that they could find a ready market for from 50 to 100 tons per month if they could get the nuts at a reasonable figure.

Regarding the right varieties to plant there appears to be much to be said for both the thin shell and medium shell nut. The actual value of the crop was, of course, based on the proportion by weight of kernel and shell, so that it could be taken for granted that big kernels were a desirable feature. The actual thickness of the shell within reasonable limits would, it was hoped, in the future present no serious difficulties as quite a number of inventions were being made and tried out, both for hand-cracking and cracking by means of rollers.

The industry was, of course, as yet in its early stages and much had yet to be done to place it on a sound footing.

It had been a matter of some difference of opinion at the conference as to whether the Australian nut grow true to type from seed, but apparently it did not. Experiments would have to be carried out to ascertain the most successful method

of grafting and vegetative reproduction, and in this connection it was hoped shortly to establish an experimental farm where different varieties would also be tested out.

It is proposed to hold a second meeting of the Association in Brisbane on the Thursday of Exhibition week.

Halo Blight of Beans.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) has made available the following advice to prospective bean growers:—

Halo blight, a bacterial disease of beans, was responsible for considerable losses last season. Already numerous complaints have been received by the Department of Agriculture and Stock during the past few weeks of bean crops in various districts being affected with this trouble. Hence it is anticipated that the disease will be just as prevalent this year as it has been in the past.

Halo blight affects the stems, leaves and pods, and under favourable conditions may result in the complete destruction of a crop. Seed from diseased plants may carry the causal bacterium or germ both internally and on the surface. When such infected seed is grown the resulting plants are diseased. So far it has not been found possible to destroy the organism in the seed without also destroying the seed itself. Hence the only practical method of avoiding the disease depends on planting only seed which has been derived from a disease free crop. Even if it were economical to spray bean plants with a fungicide it would be ineffective on plants which are already diseased, as is the case with those derived from contaminated seed.

It would appear from the number of outbreaks occurring that a large proportion of the seed being used at present is carrying the causal organism of this disease; consequently growers are advised to make sure that any seed purchased has been obtained from healthy crops only. If such a guarantee cannot be obtained it would be wiser not to plant beans at all until a satisfactory supply is available. Certain lines of seed from Norfolk Island are probably amongst those most likely to be free from the disease at the present time.

Should clean seed be available it would be advisable to plant a special plot for next season's seed supply, as well as making the usual planting. This seed plot should be carefully examined during the growing period and any plants showing symptoms of the disease should be removed and destroyed as soon as observed. At the end of the season seed should be saved only from unblemished pods on perfectly healthy plants.

Poisoning of Mice—An Effective Mixture.

Mr. S. Wilson, of Lake Cowal Station, Marsden, has notified the New South Wales Department of Agriculture that very effective results had been obtained by using a mixture for poisoning mice. This was made by boiling in a 5-gallon drum 1 lb. of commercial arsenic in 4 gallons of soft water, no washing soda being required. The drum should be hung up, so that the mixture boils from the bottom, otherwise the arsenic will not be completely dissolved. After boiling for about twenty minutes, sufficient water should be added to bring the quantity up to 4 gallons again.

For use, a gallon of the mixture should be diluted in 20 gallons of water. In summer, mice drink this readily. Stakes in pairs should be driven in the eave of the haystack in several places. A tin meat dish should be tied by the handles to the stakes, to prevent strong winds upsetting it. Two or more flat pieces of board about 2 inches wide should be used as ramps for the mice to drink from.

Mr. Wilson stated that mice poisoned in this way will not damage the hay for feeding to horses.

Peanut Board.

The following Peanut Board nominations have been received:—

District No. 1 (Wienholt and Nanango)—

Norman James Christensen, Wooroolin.

Frederick Christian Petersen, Kingaroy.

District No. 3 (Rest of Queensland other than Central Queensland)—

Albert George Whiting, Atherton.

The date fixed for the return of the ballot-papers to the Department is on or before the 24th August next. Mr. Petersen is the present member for District No. 1.

Rural Topics.

Know How to Rear Pigs.

Messrs. Pope Brothers, whose property at Nambour, Queensland, is divided into three dairies, make pig raising a very profitable sideline in their business. Pinning their faith for many years to the Middle White breed, they have done remarkably well, and find a ready demand for stud pigs and weaners. Through careful selection Pope Brothers have built up a herd of sows for prolificacy and rearing capacity considered to be well above the average. Home-bred sows are kept, and every few years a boar is imported from another stud—at present a New South Wales bred sire is doing service.

Figures recently supplied from one of the Pope Brothers' farms, where four Middle White sows are kept, show what can be done when selected breeding stock are kept and given reasonably good conditions:—

Mid. White Sow.	Farrowed.	Pigs Born.	Pigs Reared.
1. Rose	27-8-31	10	10
2. Bud	29-8-31	9	9
3. Crystal	12-12-31	9	9
4. Pearl	13-12-31	8	8
5. Rose	23-3-32	13	10
6. Bud	4-3-32	8	8
7. Crystal	14-6-32	10	10
Totals		67	64
Average		9·5	9·1

Note regarding Litter No. 3.—Sow's first litter.

Note regarding Litter No. 4.—Sow's first litter.

Note regarding Litter No. 5.—Sow suffered from fever after farrowing, and the ten pigs were hand-reared, as the sow's milk flow ceased a few days after farrowing.

Note regarding Pearl.—Pearl was a few days off farrowing again when these figures were taken on the 5th July, 1932.

Value of Trees on the Farm.

Though their claims are so generally neglected, trees serve many important purposes on farming and pastoral areas. They may be usefully employed in the following ways:—

As windbreaks and shelter belts. As isolated or scattered shade and shelter trees. As a reserve supply of fodder for periods of drought. As tree plantations to supply the timber and fuel requirements of the farm, in addition to providing a source of revenue by the sale of products. As screens around dams and tanks to prevent silting up by dust and undue evaporation of the water contents. As a means of preventing erosion on slopes and along the banks of creeks and rivers. As a means of enriching worn-out or poor land. As ornamental trees in improving the appearance of the homestead. As bee trees.

Generally speaking, May to August are the best months for tree planting.

Virtue of Green Feed.

The value of green feed is frequently emphasised in recommendations on stock feeding, its virtues being latterly largely attributed to its vitamine content. Recent research shows, however, that the actual chlorophyl (green colouring matter) is of significance in the process of nutrition.

The fact is of particular interest in relation to the control of osteomalacia (bone-chewing) in cattle, points out the Chief Veterinary Surgeon of the New South Wales Department of Agriculture in drawing attention to the discovery in an article in the current "Agricultural Gazette." In an article in that journal some nine years ago, observes the writer, attention was drawn to the value of the supply of bonemeal for many of the cattle running on the poorer coastal country and the equally high value of the supply of small quantities of actually growing green feed.

It was pointed out that, much of the country being calcium-deficient and the drain of calcium from a milking cow being heavy, it was necessary to do everything possible to enable the animal to utilise calcium present in the food. Actual experience in the field has shown the benefit of providing in late winter and early spring months a small quantity of growing green feed for cows. Based on the knowledge available at that time, the suggestion was made that this was probably due in part at least to the vitamine content of such green food.

Recent work published in German journals provides a further explanation. It appears that chloropyl has, according to the authors under consideration, a definite action in assisting animals to utilise the calcium in their feed. On the other hand, chlorophyl which has been changed by the influence of drought, heat, or acid fermentation, prevents this utilisation. When calcium is not properly utilised osteomalacia is likely to occur. There is indicated, therefore, in this work an additional reason for providing some growing green crop for the cattle during the months when the ordinary pastures are at their worst.

The Pig Industry—Export Possibilities.

In an interesting and informative report on the Australian pig industry, recently published by the Council for Scientific and Industrial Research, it is pointed out that, with the co-operation of Mr. R. B. Kelley, B.V.Sc., an officer of that body who has recently returned to Australia from a visit to the United States and Great Britain, a considerable amount of valuable data has been collected for the information of farmers interested in this branch of agriculture.

It was in May, 1931, that the Council, through its Queensland State Committee, received a request from the Queensland Pig Industry Committee that various problems relating to pig production in Queensland be investigated, one of the principal problems being that of infant mortality in pigs, a trouble the committee believed to be largely of a nutritional nature, and therefore amenable to control.

Mr. Kelley happened at that time to be in the United States investigating various other matters, hence he was instructed to give attention to the pig industry, and his report (now submitted) contains his view on various aspects of this important industry. Mr. Kelley points out that the countries most prominent in the international trade in these products—the United States of America, Denmark, Netherlands, Canada, and Germany—are differently situated to Australia in that the first three are mainly producers, while the latter two—Canada and Germany—are mostly consumers. He emphasises that England has a greater importation of pig products than any country in the world, and it is the English demand for bacon carcasses in which he finds the greatest prospect for Australian producers.

His contribution to the literature available on this industry is very welcome indeed, especially as it comes at a time when consideration is being given right throughout Australia to organisation of the pig industry on lines that would encouarge the building up of suitable overseas outlets both for frozen pork and bacon carcasses shipped in a frozen state for conversion into bacon at port of discharge in Great Britain.

The feeding of pigs for export is discussed at some length, largely from points of view of the nutritive ratios of food materials readily available in Australia and of balancing the diets.

Abnormalities and pathological conditions affecting costs are discussed in connection with small litters and deaths at birth, deaths soon after birth, sanitation, the McLean county system for parasitic control, paralysis, seedy belly, soft pork, and yellow fat.

The report presents a very useful survey of the position, as it is both in Great Britain and America where the nutrition and diseases of pigs have been extensively investigated, for in Europe and America, as well as in Great Britain, the pig industry is a very important one. Important questions dealt with in addition to those referred to above include the populations and consumptions of pigs in various countries, the requirements of the English market and how they are being met, the possibility of an export trade from Australia, standardisation of suitable export types, the production of the export type, and general conclusions.

Tractor Operation—Fuel an Important Factor.

To obtain the best possible operation from a tractor it is desirable that the owner should carefully study everything connected with it, so that the troubles that have beset many a tractor may as far as possible be avoided. One decision a tractor owner must make is in choosing a suitable fuel, which must always have a very important bearing on the operation which may be expected from the machine.

An essential requirement in a power kerosene for use in tractors is high volatility, which means "readiness to vaporise." Kerosenes that will not vaporise readily are liable to have several defects.

Efficient combustion cannot be obtained with an unsatisfactory air-fuel mixture, and kerosenes of low volatility will not give a proper mixture. If the fuel is too heavy to readily mix with the air, liquid particles will be carried into the cylinder as part of each charge. These liquid particles are practically incombustible in the normal kerosene engine, and this means that the whole of each charge will not be burned. Maximum power output therefore cannot be obtained, and much fuel is wasted.

Apart from being wasted the vaporised and unburned fuel will do actual harm in its effect on the lubricating oil. Its washing effect on the lubricating film on the cylinder walls and its final deposition in the crankcase oil are dangerous. Crankcase oil dilution has ever been the bugbear of the kerosene engine operator, as it is the root cause of many bills for repairs and replacement of parts. It may seem stretching a point to directly connect the invoice for a new bearing with the invoice for a supply of low-grade kerosene, but it has been proved time and again that the fuel used has been directly responsible for repairs needed.

The wise tractor owner therefore uses a highly volatile kerosene, such as Voco power kerosent, from which he can expect, and does get, a complete combustion, which means delivery of full power from every charge and an absolute minimum of oil dilution.

Its capacity for smooth idling and for quick takeup of increased load, as well as its ability to permit switch over quickly and without trouble, are governed by the volatility of a kerosene. Highly volatile kerosenes will do these things easily, whilst fuels of low volatility will smoke, splutter, and stall because they do not readily respond to the varying needs of the engine.

Volatility should be combined with other attributes in the kerosene that will give the best operation of a tractor engine. It is not worth having a fuel of good volatility unless there is also high resistance to knocking in that fuel. High anti-denotating property in a kerosene means that you can work at full load hour after hour, negotiate the tough bits of ground without faltering, all without that knock that tells you power is being lost and engine parts strained. Voco power kerosene is well known for its excellent knock-resisting properties as well as being a thoroughly refined product.

A Point in Pig-feeding.

It is necessary, if the best price is to be obtained, that pigs should be of the correct type, well fed and topped off before being sent to the market, and the growing conditions should be so arranged that they develop and arrive at the desired weight in a specified time. A system of grading should always be in operation on the pig farm, each grade being kept in its own yard or small paddock. Unless such a system is followed the large pigs do not give the smaller ones a chance, the result being that the latter take longer to get into market condition, with consequent loss to the producer.

Control of Fowl House Vermin.

With the approach of warm weather poultry farmers should be on the alert for signs of such parasites as red mite and (in inland districts) fowl tick. For the control of those parasites of poultry which spend portion of their life on the roosts and other parts of the poultry house, in which category are both of those just mentioned, there is nothing more effective than thorough sprayings with kerosene emulsion.

To make the emulsion, take 8 oz. of soft soap and dissolve it in 1 gallon of boiling water; take the mixture off the fire and add slowly 1 gallon of kerosene, stirring all the time. This mixture should be agitated briskly until the oil and the soapy water are thoroughly emulsified. These 2 gallons are then designated the "stock." Add this to 8 gallons of soft water. Hard water will not do, nor should lime or any caustic substance come in contact with it, or the result will be that the oil will separate from the soapy water, and the emulsion will be spoiled.

If it be desired to make the spray also a disinfectant, add one tablespoonful of miscible carbolic acid to each gallon of emulsion. The whole should be kept well stirred, especially when adding water.

A small force-pump suitable for this work, which can be stood in a kerosene tin and held down by means of a foot-rest that is provided, is obtainable at a small cost.

Tractor or Horses—A Farmer's Debate.

Members of the Wolseley Branch of the Agricultural Bureau of South Australia spent an evening recently in discussing the relative merits of tractors and horses for field work. The gist of their arguments, pro and con, is contained in the following extract from the Journal of the Department of Agriculture, South Australia:—

Tractor versus Horses.—Mr. S. J. Baker read the following paper:—"First it is necessary to purchase a good, reliable make of tractor, which will cost approximately £500. The life of the tractor will depend on how it is looked after. If the manufacturer's instructions are followed a tractor should give seven to ten years of general farm work. After having worked the tractor for two years have the engine overhauled once each year. For the soil in this district one requires a tractor that will do at least a 10-horse job, and one that will work twenty-four hours a day when necessary. The cost of ten horses, harness, stable, and feed for the first year would cost as much as a tractor and fuel for the first year. Tractor and fuel for the first year, £650. Horses:—Ten at £30 each, £300; harness, £8 per horse, £80; feed, £20 per horse, £200; chaff, shed and stables for ten horses, £100; total, £680. The tractor would be much quicker than the ten horses, and time is worth considering. With tractor farming one would not require to employ so much labour as farming with horses. Ten horses would require approximately 50 acres for grazing per year. With a tractor this 50 acres could be cropped and show a good return. The attention that a tractor in working order requires would not be more than half an hour a day. With horses it is necessary to get up early to feed and groom; this is wasted time. When the ground is suitable for horses to work on it is suitable for a tractor, and, done with a tractor, has a better appearance, and there is not so much waste time. The tractor will not tire from heavy working. When a horse breaks down it must have a spell, and therefore a spare horse or two has to be kept on the farm. With a tractor small mishaps can be fixed up in very short time, and not much knowledge is required. When the day's work is finished a tractor is ready for duty the next morning, and does not want feeding."

Horses versus Tractor.—Mr. S. Snoad read the following paper:—"It is easier to start farming with horses than with a tractor, because of the difficulty of obtaining finance. Whilst horse-power is slow, it is steady, and there is not so much likelihood of breakdowns. There are farmers in this district who owned tractors, yet they work horses, and leave the tractor in the shed. A horse farmer can maintain his team by rearing one or two foals each year, and so keep the team young and active. The life of a tractor is only about five years. To obtain the best results from a tractor the machine should be worked by the same man the whole time. Probably the lack of experience in tractor drivers is one of the greatest obstacles at present in the way of successful power farmers. The person in charge of the engine should realise that a very delicate piece of mechanism has been placed in his hands, and that skill and attention are needed constantly if best results are to be obtained from the tractor. A team driver does not need any mechanical knowledge to manage and drive horses. The work of a team of horses is done silently and without the continual vibration which eventually affects the nerves of the operator of the tractor. A farmer can do the work much cheaper by having a good grass paddock for his horses for working the fallow. I worked 140 acres three times on one feed a day. The horses were got in in the morning from the paddock and worked until dinner time, and then turned out again in the paddock at night. They were in fat condition the whole time."

Horses versus Tractor.—The following paper, putting the claim for horse as being the most efficient and economic worker on the farm was contributed by Mr. E. Sharrad, who proposed to deal with farms of no more than 700 acres:—"This farm cannot be more efficiently worked with a tractor than with horses. In the Tatiara, in a normal year, one has to do a certain amount of fallowing when the crabholes are full of water. The horses will do this job, as well as the hundred and one small jobs on a farm which require a horse. The horse has helped to buy most of the tractors on the farms. I have worked both the tractor and horses, and would rather drive the horses. The latter is a cleaner, warmer, and a quieter job. If one horse is sick it can be replaced at very little cost; one can perhaps borrow from a neighbour who has a few idle horses. If the same trouble persists in a tractor it is impossible to borrow another tractor, and one may possibly be hung up for a week or two in seeding or harvest, waiting for repairs. Most writers, when comparing the relative value of the horse and tractor, put too high a price on the horse. A half-draught horse can be bought for £10 or £15, which will do the work, and do it well. There is no necessity to pay high prices for horses. A young farmer starting on a farm on his own can aim at getting a good team by gradually raising the class of his team

by breeding. Two good mares will breed up a team in a few years, and by always breeding a couple of foals every year it will not be necessary to pay high prices to fill up the gaps in the team, occasioned by old age and the loss of a horse. The cost of keeping a foal is very light until it is ready to break in. After paying for the service of a good sire, there is practically no expense until it is time to break in the foal, and then only at a cost of about £3 10s. for harness, which, if carefully looked after, will last for twenty years. The heavy initial cost of the tractor gives the farmer a good deal of worry wondering if he is going to pay for it. The tractor is a continual drain on the finances of the farmer for grease, benzine, and kerosene all through seeding and harvest. Money is sent out of the Commonwealth for the tractors and all that propels them comes from overseas. The horse and all its harness are products of Australia. It should be the aim of all farmers to build up the Commonwealth by using horses, thereby effecting a saving of money.''

TRACTOR VERSUS HORSES.—Mr. A. Grosser read the following paper:—''The tractor has its advantages and disadvantages. If farmers would realise that the power of a tractor is limited to pull a certain load it would give far better results. The life of a tractor depends on the treatment it receives. One does not hear of a farmer going out with an eight-horse team and pulling two ploughs with it; yet this is not uncommon with the tractor. The most important point to watch is the oiling. Also water and grease the cups, and keep all bolts tight. The tractor is able to take the place of an engine for cutting chaff, and can be used to assist in putting in and taking off the crop at a critical stage. Horses have to be given a spell, but the tractor, with proper care, will work continuously. It can also be used for pulling trees and pumping water. The tractor is worthy of a place on the farm. Those in the past who were not in favour of tractors have one to-day.''

HORSES VERSUS TRACTOR.—''There is no doubt that the tractor has its good points, but from my experience, horses are the best all-round form of farm power,'' said Mr. H. W. Orton, in a paper on this subject. ''Australia produces its own horse-power, and by using this power we are helping ourselves. The tractor is made overseas, the fuel is imported, and the money goes to other countries. It is argued that the tractor will sow twice as much area as a team of horses. This is possibly true, if everything goes well; but in the case of a breakdown with the tractor it will mean perhaps the loss of a week before the part is replaced. If a horse becomes sick, at a pinch it is possible to carry on with one less, but generally there is a spare horse on the farm that can be used until the sick one recovers. If at fallowing the ground becomes wet and the crabholes boggy, the horses are able to get along, but the tractor bogs and makes a poor job of fallowing. At harvest it does not pay to work the tractor half loaded, and the average-type is not more than half-loaded when pulling a harvesting machine. This is waste of fuel. It requires two men to operate a tractor and stripper; one can drive a team of horses and work a stripper, and there is no danger of fire with horses. When carting wheat horses load the wagon with the bag-lifter, which would be a very tiresome job for the tractor. The feed which the horses eat for the year does not cost the farmer a great deal to produce, but fuel which the tractor uses requires money to procure. Tractor driving is a strain on the nerves, but it is a pleasure to drive a team of good horses.''

QUEENSLAND SHOW DATES, 1932.

Royal National: 8th to 13th August.

Crow's Nest: 24th and 25th August.

Wynnum: 26th and 27th August.

Mary Valley, Imbil: 2nd and 3rd September.

Enoggera: 3rd September.

Pomona: 14th and 15th September.

Malanda: 14th and 15th September.

Beenleigh: 16th and 17th September.

Rocklea: 24th September.

Southport: 7th and 8th October.

Nerang: 14th October.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

SAVE THE CRIPPLES.

THE recent epidemic of infantile paralysis caused much alarm. The mysterious way in which it spreads, the impossibility of escaping infection, and the crippling paralysis, which it may leave behind, were a natural cause of anxiety to all parents. Now that the epidemic is over, all this may be forgotten. That would be deplorable, for now is the time when we should be giving it the most serious consideration.

Medicine has made some advance recently in the treatment of this disease. Its earliest symptoms before the onset of paralysis have been carefully studied. By the use of human serum the onset of paralysis has been prevented in many cases, but this can be done only when the disease is seen and recognised in the earliest stages. This epidemic has left many cases more or less paralysed. During the two months after the acute stage is over there is a strong tendency to recovery. Some recover completely. More often one or several muscles are left still paralysed; sometimes extensive paralysis remains.

Grave Penalty of Neglect.

What is to be done for the cases that have not completely recovered? Even one paralysed muscle may be a serious disability. The paralysis of many will need the most careful treatment, if the child is not to become a hopeless cripple. Now is the critical time. Neglect now will injure the child's whole future life.

The epidemic prevailed in Sydney before it attacked Brisbane. Of 120 cases in a Sydney hospital twelve died, forty-two were discharged completely recovered, sixty-six had still some damage to the muscles. Of these last about half are expected to recover completely under proper care within six or twelve months. The remainder have sustained permanent damage, and only the most persistent and skilful tratment will save many of them from hopeless life-long disability. Suppose thirty of them live for forty years on the invalid pension of £1 a week. This will entail a cost to the State from the cases admitted into one hospital of over £60,000. Even from this point of view it is an important matter.

The treatment of these serious cases should be commenced at once, indeed it should never have been discontinued. The treatment will demand unremitting attention and often from a highly skilled specialist, and should be continued for at least two years. If after that period any muscles remain hopelessly paralysed the resultant crippling may sometimes be minimised by skilful surgery. It is obvious that in all but a few cases this necessarily prolonged specialist treatment can be obtained only in a hospital. However reluctant parents may be to part with their children, it is in this instance an imperative duty.

"A Nest of Cheeky Youngsters."

For the crippled child residence in hospital is no hardship. After the first week the child has become accustomed and reconciled to the immobility imposed by his splints. A child never complains as we do, of having had to lie in bed for six weeks or six months. He lives through each day as it comes, and each day suffices for itself. Whoever imagines that a cripples' ward is a sad and melancholy place has been misled by his morbid imagination. On the contrary it is a nest of cheeky youngsters, by far the happiest ward in the hospital. From each other they derive cheerful companionship, that first necessity for child happiness. They have their own amusements and laugh at their own jokes. While their bodies are being treated, their minds are not neglected. They form a school free from all punishments, but more zealous than a school of healthy children, and are taught by a State school teacher. For those who may not be able to earn their living by muscular work, a good education is of more importance than for most.

Even the most wealthy can hardly secure these advantages. What a crippled child wants is not abundant toys or rich living. Above all he does not want openly expressed sympathy or pity. He needs cheerful companionship, suitable occupation for body and mind, restoration as far as may be of his muscular power, and an uninterrupted education. There are few things more pitiable than the neglected case of paralysis developing into permanent deformity.

TO PRESERVE ORANGES.

Oranges can be preserved whole, and make a very handsome product in glass jars for purely spectacular display, but their flavour is quite insipid. Cut fruit gives a far better flavoured article. The ripe oranges are cut into V-shaped sections, with a width of about ¾ inch at the rind. After packing the cut fruit in jars fill with cool strained syrup made with 5 lb. to 6 lb. sugar to 1 gallon water. Place the jars in a cold bath, which is brought to the boil and kept boiling for five minutes. Then remove the jars. An alternative method is to cook for thirty-five minutes at a temperature of 190 deg. Fah.

Oranges so preserved can be used in salad, or if served with cream they make a very palatable sweet.

CHILDREN OF THE WEST HEALTHY ON GOATS' MILK.

"Good, rich goats' milk sticks to the children of the West as nothing else could do," the Chief Medical Officer of Health of the Department of Public Instruction (Dr. St. Vincent Welch) said recently in talking of a tour of inspection of the schools of the far North-West, from which he had just returned. The children he saw in the districts about Cloncurry, Duchess, Mount Isa, Camooweal, and Dajarra were extraordinarily healthy, except for eye troubles, he said. He attributed much of their strong and wiry condition to "the absence of a good deal of the rubbish other children get to eat." The children of the West, he said, get good, healthy food —meat, vegetables, and plenty of goats' milk.

Apparently some of the local authorities had recognised the value of the goat, both for milk and meat. At Camooweal, Urandangie, and several other places the Shire Councils had undertaken to provide blood stock of an exceptionally fine type with which to improve the goat herds of their districts. The Sinan goat, a very large, big-boned animal, had been chosen, and sires of this breed were used with considerable benefit in grading up the local herds, many of which contained 500 to 600 goats.

The goat was an exceptionally healthy animal, Dr. Welch said. It was extremely fortunate that Australia was free form the Mediterranean disease known as Malta fever, which was spread by the use of unboiled goats' milk. The germ, which caused a serious undulant fever, was conveyed to human beings from goats by the milk. It was unknown in Australia, and the importation of goats should be watched with the utmost care to keep it out of the country.

"Goat's milk is the best for 'kids'—human ones—but, unfortunately, it is hard to get in most places. Tropical children thrive on it," said Professor Osborne, of Melbourne, recently.

He made the assertion in correcting an impression that might have been gained from a recent statement he made that cows' milk helped to make Darwin children taller than in Britain. He explained that the chief reason for this contrast was the greater sunshine enjoyed by Darwin children. Cold caused the growth of children, as well as other living things, to halt in the winter. With continuous sunshine and warmth growth was continuous.

In addition to the effect of the sun on the growth of children, the quality of the milk and other food they received helped their development.

Grown in abundant sunshine the food gained more of the growth element—vitamin "B." Cows in Australia gave better milk than cows elsewhere. It contained more of vitamin "B" because the animals were exposed to the sunlight for such a great part of the year.

Cows, of course, did not do so well in the subtropical areas. The tendency was for them to be smaller and less productive.

But the children in those parts were really better served with the milk of the goat. It was all tubercle free, the goat being immune from the germ. Also it was better in other ways.

"A teaspoonful of goat's milk in a cup of tea is worth three of cow's milk, for instance," said the professor. "The goat gives more milk weight for weight than the cow."

CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

THE HOME VEGETABLE GARDEN.

Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and, not unusually, generous reward, are to be gained from this work.

The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

Farm Notes for September.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

Orchard Notes for September.

THE COASTAL DISTRICTS.

SEPTEMBER is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficent plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle-borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary, manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash—two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared—viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure; which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

WHERE not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

CLIMATOLOGICAL TABLE—JUNE, 1932.

Supplied by the Commonwealth of Australia Meteorological Bureau, Brisbane.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·02	79	66	84	6	58	28	17	3
Herberton	..	71	50	78	16	30	27, 28	77	4
Rockhampton	30·09	73	52	82	3	40	21	75	7
Brisbane	30·09	68	52	77	2	42	19	60	6
Darling Downs.									
Dalby	30·13	65	41	79	2	27	19	162	7
Stanthorpe	..	57	36	70	2	18	19	80	8
Toowoomba	..	60	41	73	2	27	19	105	7
Mid-interior.									
Georgetown	30·01	82	59	88	2	41	30	0	..
Longreach	30·11	71	46	85	1	33	28	52	5
Mitchell	30·14	65	39	79	2	24	22	96	4
Western.									
Burketown	30·05	81	59	88	2, 15	45	21	0	..
Boulia	30·12	69	48	83	14	38	28, 29	103	2
Thargomindah	30·14	64	44	78	1	32	22	41	5

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of June, in the Agricultural Districts, together with Total Rainfall during June, 1932, and 1931 for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1932.	June, 1931.
North Coast.	In.		In.	In.
Atherton	1·61	31	0·83	2·05
Cairns	2·86	50	0·71	5·80
Cardwell	2·00	60	1·40	1·14
Cooktown	2·06	56	0·17	3·34
Herberton	1·04	45	0·77	1·66
Ingham	2·33	40	0·80	1·60
Innisfail	7·21	51	3·87	11·17
Mossman Mill ..	2·15	19	0·75	3·95
Townsville	1·30	61	0.15	0·10
Central Coast.				
Ayr	1·42	45	0	0
Bowen	1·62	61	0	0
Charters Towers ..	1·29	50	0·02	0·01
Mackay	2·65	61	1·09	0·48
Proserpine	3·39	29	0·48	0·79
St. Lawrence ..	2·54	61	0·88	0·31
South Coast.				
Biggenden	2·26	33	0·18	0·36
Bundaberg	2·93	49	0·28	1·17
Brisbane	2·79	81	0·60	0·57
Caboolture	2·84	45	1·00	1·14
Childers	2.59	37	0·39	0·50
Crohamhurst ..	4·79	39	1·71	1·19
Esk	2·36	45	1·23	0·38
Gayndah	1·86	61	0·61	0·37
Gympie	2·76	62	1·08	0·69
Kilkivan	2·18	53	0·35	0·44
Maryborough ..	3·12	60	2·25	1·63

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1932.	June, 1931
South Coast—continued	In.		In.	In.
Nambour	3·98	36	1·93	1·50
Nanango	2·09	50	0·37	0·43
Rockhampton ..	2·52	45	0·75	0·37
Woodford	3·09	45	0·50	0·82
Darling Downs.				
Dalby	1·71	62	1·62	1·33
Emu Vale	1·59	36	0·36	1·54
Jimbour	1·73	44	1·61	1·13
Miles	1·83	47	0·74	1·55
Stanthorpe	1·97	59	0·80	2·05
Toowoomba.. ..	2·50	60	1·05	1·40
Warwick	1·80	67	0·64	1·70
Maranoa.				
Roma	1·63	58	0·78	1·04
State Farms, &c.				
Bungeworgorai ..	1·44	18	0·68	0.87
Gatton College ..	1·95	38	1·04	0·47
Gindie	1·48	33	0·16	0
Hermitage	1·92	26	0·45	1·61
Kairi	1·40	18	..	0·84
Mackay Sugar Experiment Station ..	2.34	35	1·15	0·26

J. H HARTSHORN, Acting Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1932.		September. 1932.		MOONRISE. Aug., 1932.	MOONRISE. Sept., 1932.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·38	5·18	6·10	5·34	5·39	6·12
2	6·37	5·19	6·9	5·34	6·27	6·46
3	6·36	5·20	6·8	5·35	7·6	7·21
4	6·35	5·20	6·7	5·35	7·42	7·56
5	6·35	5·21	6·6	5·36	8·17	8·33
6	6·34	5·21	6·5	5·36	8·48	9·16
7	6·34	5·22	6·4	5·37	9·21	10·5
8	6·33	5·22	6·3	5·37	9·56	11·3
						p.m.
9	6·32	5·23	6·2	5·38	10·33	12·6
10	6·31	5·23	6·0	5·38	11·15	1·9
					p.m.	
11	6·30	5·24	5·59	5·39	12·10	2·11
12	6·29	5·24	5·58	5·39	1·9	3·15
13	6·28	5·25	5·57	5·40	2·18	4·13
14	6·27	5·25	5·56	5·40	3·17	5·10
15	6·26	5·26	5·54	5·41	4·21	6·4
16	6·26	5·26	5·53	5·41	5·25	6·57
17	6·25	5·27	5·52	5·42	6·23	7·50
18	6·24	5·27	5·51	5·42	7·19	8·46
19	6·23	5·28	5·49	5·43	8·12	9·42
20	6·22	5·28	5·48	5·43	9·5	10·37
21	6·21	5·29	5·47	5·43	10·	11·29
22	6·20	5·29	5·46	5·44	10·54	..
						a.m.
23	6·19	5·30	5·45	5·44	11·52	12·24
24	6·18	5·30	5·44	5·44	..	1·17
					a.m.	
25	6·17	5·30	5·43	5·45	12·45	2·8
26	6·16	5·31	5·42	5·45	1·41	2·52
27	6·15	5·31	5·40	5·46	2·36	3·32
28	6·14	5·32	5·39	5·46	3·28	4·8
29	6·13	5·32	5·38	5·47	4·17	4·42
30	6·12	5·33	5·37	5·47	5·0	5·17
31	6·11	5·33	..	..	5·39	..

Phases of the Moon, Occultations, &c.

2 Aug.	● New Moon	7 41 p.m.
9 „	☾ First Quarter	5 40 p.m.
16 „	○ Full Moon	5 41 p.m.
24 „	☽ Last Quarter	5 21 p.m.

Perigee, 8th August, at 5·42 p.m.
Apogee, 23rd August, at 7.42 a.m.

Mercury, Venus, Mars, Jupiter, Uranus, and Neptune will be in conjunction with the Moon during the month, either below the horizon or in daylight.

Venus having left the western sky at the end of June will be a brilliant morning star, at its brightest on and near the 5th.

Mercury, being between the Earth and the Sun on the 17th, will be lost in his rays.

Venus will apparently pass right through Gemini during the month; Mars will be in Taurus till the 5th, then in Gemini till the 31st; Jupiter, in Leo from the 1st to the 31st, will be near Regulus on the 5th; Saturn in the western part of Capricornus during the whole month. The Moon will pass 4 degrees to the southward of Saturn at 10 p.m. on the 14th.

Mercury sets at 7.6 p.m. on the 1st; on the 15th it will be in inferior conjunction with the Sun.

Venus rises at 4 a.m. on the 1st, and at 3·36 a.m. on the 15th.

Mars rises at 3·55 a.m. on the 1st, and at 3·39 a.m. on the 15th.

Jupiter sets at 6.56 p.m. on the 1st, and at 6·6 p.m. on the 15th.

Saturn rises at 4.41 p.m. and sets at 6·13 a.m. on the 1st; on the 15th it rises at 3.43 p.m. and sets at 5.14 a.m.

The Moon being new on the 2nd will have its dark side to the Earth and be invisible on account of its nearness to the sun till the 4th, when a thin crescent, back downwards, may be seen in the west within an hour after sunset. It will apparently be passing through Virgo from the 5th to the 9th, through Libra on the 9th, Scorpio on the 10th, and 11th it will be in Orphiueus on the 11th, Sagittarius on the 12th and 13th, Capricornus from the 14th to the 16th, Aquarius from the 16th to the 19th, Pisces on the 19th and 20th, Aries on the 22nd and 23rd, in Taurus and Auriga from the 24th to the 27th, Gemini on the 27th and 28th, in Cancer on the 29th, on the border of Cancer and Leo on the 30th, and new again on the 31st.

The Southern Cross will be at position II. at 8 p.m., III. at 10, and IV. at midnight on the 1st changing gradually to positions III., IV., and V. at the end of the month.

4 Sept.	● New Moon	5 55 a.m.
7 „	☾ First Quarter	10 49 p.m.
15 „	○ Full Moon	7 6 a.m.
23 „	☽ Last Quarter	10 47 a.m.
30 „	● New Moan	3 30 p.m.

Perigee, 4th September, at 4·48 a.m.
Apogee, 20th September, at 1·54 a.m.

Mercury being at its greatest elongation, 18 degrees west, on the 3rd will be visible about 14 degrees north of east, about an hour before sunrise. It will be gradually drawing nearer to the Sun till on the 29th it will be in superior conjunction with it.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Back to the Land.

"THE time is opportune for a back-to-the-land movement," declared the Premier, Mr. W. Forgan Smith, in the course of a recent Press interview. He advised parents to direct the minds of their children to life on the land, and pointed out that even in normal times there were not sufficient jobs to meet the demands of those who drifted to the cities. The Premier said he agreed entirely with the view, publicly expressed, that parents should turn to rural pursuits instead of to clerical occupations for their children. Queensland was essentially a primary-producing country, and parents should try, as far as possible, to direct the attention of their boys towards life on the land. With the development of secondary education in recent years the tendency had been to look for clerical and other professional openings, but even under normal conditions there were insufficient jobs to go round. The attitude of the public mind was such that the time was opportune for a back-to-the-land movement.

Rural Training.

THE Minister for Agriculture and Stock (Mr. F. W. Bulcock) is also giving consideration to the problem. The matter had been engaging his attention for some time, he said to the Press recently, and he hoped to be able to place before the Cabinet in the near future a scheme which would aim definitely at giving boys a rural training before they embarked on country life. His department was investigating several possibilities for providing rural training for boys. It had been suggested that an organisation might be set up, using the existing services, to register boys who wished to embark on farm work. At the same time, it was suggested another branch of the same organisation might work in the bush, or public officers might be used for finding employment for boys in the country. Another

proposal was the establishment of an agricultural training centre near Brisbane, where suitable boys could be given general experience after a course of studies at the Central Technical College. The latter proposal found most favour in his eyes, and was being investigated. "The Government is definitely pledged to the formulation of a scheme to train our boys and get them on the land," added the Minister. "Side by side with this arises the question of land settlement and economic land utilisation."

Science and the Farmer.

"MOST of the problems of the farmer to-day are solved in the laboratory," said the Minister for Agriculture and Stock, Mr. F. W. Bulcock, in his presidential address at the annual conference of the Council of Agriculture last month.

Farmers, he added, should pay greater attention to the scientific side of farming, while he, as Minister, as far as the finances of the State allowed it, would do all that he could to foster scientific research in agriculture in Queensland.

After urging members of the council to keep in touch with him and his Department, more particularly as far as marketing conditions were concerned, the Minister said he intended to go into the vexed question of dual grading standards for butter and other exportable products. Mr. Bulcock said he looked at the world position in the light that, with the rapid growth of population in countries which were thickly populated, but which were still exporting, it would not be long before those countries would only be producing enough for their own consumption. It was then that Australia would have a better market for its goods, and he considered that they must be prepared to take advantage of that market. From his knowledge Queensland products compared favourably with those from other parts of the world.

He believed that the prosperity of the State depended upon the primary producer. They must pursue a policy by which some means of understanding the farmers' problems would be available to the man in the city, and the problems of the city to the man on the land. At one time there was a mutual antagonism between the dwellers of the city and the men in the country, but this was passing. The Minister said he believed that the farmer should control his own destiny, and that policy had been adopted by the primary producer in this State. To-day there was organised marketing for most products of Queensland. He did not regard the organisation as being perfect, but considered that which had been evolved during the last ten years had been very satisfactory. The next ten years ahead would most likely bring very necessary legislative enactments for the benefit of the State, provision being made for the interests of the community, and not merely for the individual.

The Beef Industry—Its Importance to Queensland.

"ONE cannot help but be impressed with the fact that the production of cattle has an important bearing on almost every industry in the State. Practically no enterprise of any kind exists that is not dependent in some shape or form on the meat industry." In these words the State Premier, Mr. W. Forgan Smith, emphasised the importance of the meat industry to Queensland, prior to declaring the Live Stock and Meat Industry Hall at the Brisbane Show open to the public. "Since 1927, the meat industry, in common with others, has undergone many vicissitudes," said the Premier. Queensland exported approximately 40 per cent. of the meat produced, and it was pleasing to know that the industry had also entered the market in regard to pork, mutton, and lamb. The figures displayed in one of the exhibits were illuminating, inasmuch as they indicated the possibility of a greater expansion of inter-Empire trade. At Ottawa the meat industry was looking for some support in the marketing of its products, whether in the form of a preferential tariff or a quota for the various constituent parts of the Empire. The Commonwealth of Australia, in common with the civilised world, was encountering problems of a magnitude hitherto unexampled, and the future of their civilisation would, to a very large extent, depend on the manner in which those

problems were approached. To-day they had the problems of unexampled productivity, and the fact that a growing proportion of people were unable to earn a reasonable or proper livelihood. These problems could only be effectively dealt with if they were regarded from a national standpoint. "In Queensland," said the Premier, "we have every variety of soil, and of climatic conditions, all the known minerals, an abundance of timber, and all the essentials to maintain a large population in a high degree of civilisation. Consequently, it is our duty to-day to be true to the pioneers of Australia, and see to it that in our generation, we are able to pioneer where necessary in a manner that will benefit future generations."

Referring to some of the problems of the industry, Mr. Smith said that on the marketing side, developments of a far-reaching character appeared to be imminent. At present, Australia suffered in the overseas market very largely because of the fact that their meat arrived in a frozen condition, and competed with the products of other countries that could land their product chilled—which was an obvious advantage. He understood, however, that research was proceeding, apparently satisfactorily, in the direction of devising ways and means whereby their meat could be sold in similar fashion, and be de-frosted without the destruction of tissue that took place at the present time. "If those experiments are successful, they will mean a great deal to the cattle industry of Queensland," declared the Premier. In conclusion, Mr. Forgan Smith paid a warm tribute to the social service of men who made such displays possible, singling out for special mention the organising genius and painstaking persistency of Mr. E. F. Sunners, and ended by declaring the display officially opened.

The Buffalo Fly Menace.

COMMENTING on an opinion expressed recently that the buffalo fly will not come further south than Rockhampton, the Minister for Agriculture and Stock, Mr. F. W. Bulcock, said that the menace had been so well recognised in Java that the Dutch authorities had seen fit to employ highly-trained entomologists and parasitologists in an attempt to secure biological control. It was hoped that the results of that work would be of value in Queensland. It was difficult, continued Mr. Bulcock, to foretell the extent to which the fly would thrive in varied climatic conditions. It remained for some time in a certain area, and then began to migrate eastwards. This, he thought, was evidence that the fly was becoming acclimatised, and could live in zones where it could not exist previously. Therefore, it was necessary to regard any conclusion otherwise as problematical.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XXIX.

GLEANINGS FROM THE "SUGAR JOURNAL," PUBLISHED AT MACKAY FROM 1892 TO 1900.

Early Italian Immigration.

ON the 29th January, 1892, the Herbert River correspondent wrote:—"As you know we have Italians on the river; they are divided between Ripple Creek, Macknade, and Hamleigh. Their first pay was this month, and after it was over seven went to Mr. Boyd (of Ripple Creek) and got him to cancel their agreements, and three did the same with Mr. Neame. It seems there are two classes of Italians—the Piedmontese and the Venetians. The former are men with trades, such as carpet-makers, roadmakers, &c. The latter are agriculturists pure and simple. The Venetians seem to be taking to the work, and are likely to answer the purpose for which they were got—i.e., to take up land on their own account and grow cane for the mills. They are making every inquiry concerning canegrowing, and are only waiting with anxiety for the time to come when they may be growing cane for themselves. It is unfortunate that all the Italians are not of the agricultural class, as it would go a long way towards settling the labour question as far as this little bit of country is concerned."

The "Brisbane Courier" stated the same year—"We learn from a reliable source that some of the Italians who were brought to Queensland by Signor Fraire, and who are now settled on sugar plantations in the North, have received letters from friends in Italy expressing a desire to come to Queensland. They state they will willingly pay their passages provided they are guaranteed employment."

Electric Light in Sugar Mills.

Advocating the use of electric lighting in sugar-mills, an advertisement by Messrs. Barton and White in 1892 sets out the many advantages over kerosene. Messrs. Robb and Company, Young's of Fairymead, and Bingera, appear to have been amongst the earliest sugar-mills in Australia to adopt this method of lighting. The Bingera installation consisted of sixty lights of 16 candle power and six of 250 candle power. It was stated to have a very brilliant effect on the mill at night. Messrs. Trackson Bros., which firm is still in operation in Brisbane, erected the plant.

Splitting Up of C.S.R. Company's Estates.

May, 1892.—The Victoria Estate on the Herbert River is being cut up and let to farmers. There seems every probability that in the near future all cane crushed by the mills on this river will be grown by small farmers and that the millowners will stop cultivating for themselves. *Note.*—This was ultimately realised.

Improvement at Mackay Mills.

10th June, 1892.—Homebush appears to be doing the most extensive alterations. They are putting in a shredder to tear the cane before it

reaches the first rollers—a brush to automatically sweep the juice strainer at the rollers, and an elevator to carry the megass, &c., back to the front rollers; still further alterations in the intermediate carrier to make it travel more slowly and thus improve the maceration, and more subsiders. The boilers have been reset. A coil has been passed through the flues, and water going through it into the boilers is heated without extra cost, and is at boiling point when it gets into the boilers.

At the Eton Central Mill maceration of the most approved pattern is being put in, similar to that in use at Habana and Homebush. The juice strainer is being enlarged and made of fine centrifugal gauze.

At Racecourse, tanks, pipes, boilers, &c., are being lagged; the manager is using a composition of flour and sawdust which stands heat well and does not crack and fall away.

Rum Quotations, 1892 (in Bond).

Bundaberg Distillery—30 overproof, 2s. 3d. per gallon.

Pleystowe Distillery—30 overproof, 2s. 6d. per gallon.

The Home market was bad and the demand falling off, further shipments from Queensland were not likely for some time.

ESTIMATE OF 1892 CROP.	Sugar. Tons.
Cairns	2,000
Johnstone	5,500
Herbert	6,325
Burdekin	2,500
Mackay	15,000
Rockhampton	300
Bundaberg	20,000
Maryborough	4,500
Brisbane	1,000
	57,125

This was divided as follows:—1,800 tons yellow sugars; 11,500 tons refined whites; 23,840 tons ordinary whites; 17,285 tons refining sorts; 2,700 tons rations. The supply of Australasia was calculated to be 112,000 tons made up as follows:—

	Sugar. Tons.
Queensland	57,000
New South Wales	35,000
Fiji	20,000
	112,000

Of the whole crop 70,000 tons will be made for or purchased by the Colonial Sugar Refining Company. The consumption of Australasia, including New Zealand, was given at 160,000 tons.

Proposed Central Mills at Bundaberg.

Under date of 8th May, 1892, the Bundaberg correspondent writes—"I see that Mr. Fred Buss is advocating a scheme for the formation of Central Mills in this district. He proposes to raise a capital of £100,000 to erect four mills, at a cost of £25,000 each. Mr. Buss seems to have lost sight of a very important item, viz., the supply of cane

for such mills; they would require an annual supply of 40,000 tons in all. The small farming class who would require to be the backbone of a scheme like this are not men of capital as a rule, so that any company or syndicate would require to set aside enough of their capital to assist the farmer by monetary advances to enable him to clear and plant the necessary area of cane for the mill in the shortest time possible, so that the mills would have a full supply of cane from the start."

Shoal Bay Plantation, Northern Territory.

It is not generally known that there was once a sugar-mill and plantation at Shoal Bay, Northern Territory. The Northern Territory "Times" in July, 1892, remarked—"Cane crushing at Shoal Bay plantation is proceeding successfully, with a cheering prospect of success to the lessee, Mr. Moore. From the commencement of the present crushing up to date, the rollers have put through about 164 tons, and the yield of sugar from this amounts to a trifle over 8 tons. It was the rule to estimate 1 ton of sugar for every 20 tons of cane. The quality was sufficiently good to command a ready sale. The only labour used on the plantation was the free and independent black native of the sod."

Brisbane Refinery.

November, 1892.—"The news that the Colonial Sugar Refining Company, of Sydney, has decided to erect a refinery in Brisbane will be received with general satisfaction in this Colony. The step indicates the confidence which this company has in the future of the Queensland industry. The new refinery will occupy in all 3 acres of land fronting the Brisbane River. The work has been commenced, and its completion is expected in time for the 1893 season. It is improbable that the capacity of the plant will be less than 20,000 tons annually, and all of this will be supplied in its raw state from either the company's or private mills in Queensland."

Note.—The Refinery was opened in August, 1893.

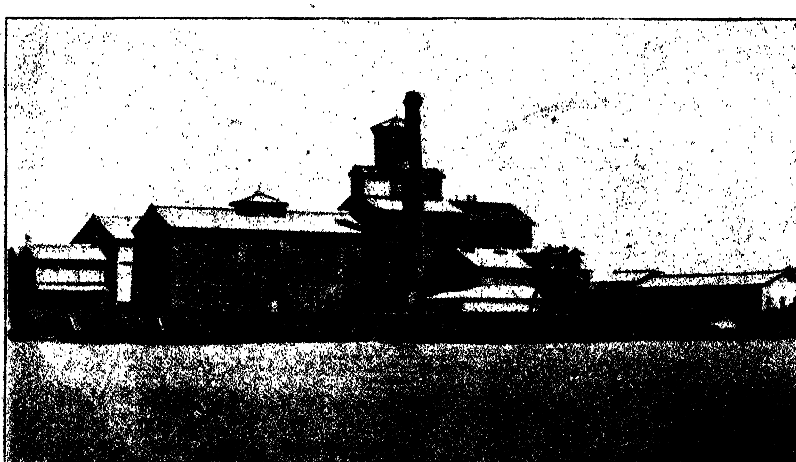


PLATE 83.—NEW FARM REFINERY.

First Mill in Mackay.

Quoting from a copy of the Mackay "Mercury" published in September, 1868, the "Mackay Sugar Journal" says—"The sugar-mill is now in full work and answering every expectation of the proprietors, Messrs. J. E. Davidson and Company. The crushers of the mill consist of three massive rollers, each 2 ft. by 4 ft. . . . On the Alexandra there are two large storehouses being filled with megass to serve as a start for firing for next year's crushing. The entire machinery was made by Fletcher and Company, of London, excepting the Gadsden's pans, vats, and chimney. The number of hands employed on the plantation is 79, viz.:—25 white men and 54 South Sea Islanders—all of whom are fully employed either cutting, carrying, feeding, skimming, spreading megass, or other work. . . . The sugar made is of first-rate quality, good colour, and rich tasting. About 200 acres are ready for crushing."

Habana Mill (Mackay) Returns, 1892.

It will undoubtedly be of much interest to extract the mill returns of Habana for 1892 for comparison with present day work. The "Mackay Sugar Journal," in publishing these, says—"The Habana figures, while not showing perfect work, are interesting and valuable, the more so because this estate is the first one in Queensland to publish results based on scientific investigation. Habanà has averaged a mill extraction per cent. of weight of sugar of 91·74, and this without any shredder or comminutor":—

Cane crushed—	
Weight in tons	23,451·05
Average per cent. cane sugar	15·44
Average per cent. fruit sugar	·36
Average per cent. other organic matter	1·43
Cane sugar in tons	3,620·90
Fruit sugar in tons	84·78
Other organic matter	335·63
First sugars—	
Total sugar in tons	1,956·25
Average analysis—	
Cane sugar	97·63
Fruit sugar	·56
Other organic matter	·35
Ash	·44
Average net titre	94·80
Second sugars—	
Total sugar in tons	369·35
Total molasses in tons	43·0
Average analysis—	
Cane sugar	91·40
Fruit sugar	1·56
Other organic matter	1·88
Ash	1·49
Average net titre	82·01
Third sugars—	
Total sugar in tons	215·80
Total sugar molasses	122·52
Average analysis—	
Cane sugar	82·29
Fruit sugar	2·05
Other organic matter	3·51
Ash	2·15
Average net titre	75·86

All sugars—	
Total sugars obtained in tons	2,725·08
Average analysis—	
Cane sugar	95·93
Fruit sugar	·84
Other organic matter	·85
Ash	·74
Average net titre	91·34
Megass—	
Average sugar	5·54
Average sugar per cent. weight of cane	1·33
Average sugar per cent. weight of sugar	8·62
Average water	45·74
Average fibre	23·31
Losses—	
In megass per cent. weight of sucrose	8·62
Loss of sucrose in megass in tons	311·89
Loss of sucrose in mill per cent. of sucrose	16·12
Loss of sucrose in mill in tons	583·93
Total loss from cane to products in tons	895·82
Extraction at rollers per cent. weight of sugar	91·74
Average cane sugar in press cake	6·34
Tons of cane to ton of sugar	8·27

Small Farms on Sugar Plantations.

October, 1893.—"To ascertain as far as possible how far the movement for the cultivation of cane by small farmers is progressing, or, in other words, how far the Central Mill question is taking root in Queensland, inquiry was made at Mackay, Bundaberg, and the Johnstone and Herbert Rivers, with the results shown hereunder, from which it is evident that the movement is increasing:—

	Acres.
Mackay—143 farmers (of whom 22 are shareholders in the Central Mills) are growing cane upon	4,264
Bundaberg—148 farmers upon	4,351
Herbert River—68 farmers upon	3,923
Johnstone River	Nil

Care has been taken in obtaining the above information to exclude all those who would come under what is generally known as 'planters.' All the above farmers (excluding the shareholders in the Central Mills at Mackay) grow cane for sale at a mill in which they have no direct interest otherwise than as a market."

Childers Mill.

In 1893 the Hon. E. Knox announced—"We are under engagement to erect another mill in Queensland, in the Isis Scrub near Bundaberg. Some months ago we received satisfactory offers from the farmers there to grow cane for us, and we have undertaken to put up a mill in time for season 1896. We have every reason to expect satisfactory returns from this venture, our sales of refined sugar continue to increase with the growth of population, and this factory will only serve to maintain the proportion of sugar that we have been in the habit of producing at our mills for the work of the refineries."

Carmilla.

Carmilla is now a well-established sugar district, but it has only been so during recent years. As far back as 1894, however, the residents were anxious to commence sugar-growing. In a publication quoted in

the "Mackay Sugar Journal" for that year it was stated—"Carmilla offers unrivalled opportunities to bona fide agriculturists and men of small capital to select virgin soil sugar lands. But suitable as the lands are for canegrowing, it is impossible for their owners to individually cultivate a sufficient area to keep a large mill employed capable of turning out, say, 4,000 tons of sugar during the season. Such a mill must have from 30,000 to 40,000 tons of cane annually. It has come to be recognised that in order to ensure success large mills are essential. Small mills can only result in disappointment and loss, and everywhere factories are becoming larger and larger. Planting is carried on more economically on a small scale, while the manufacture of sugar is made relatively cheaper when it is carried out upon a large scale, the two operations thus combined contributing to a permanent and profitable enterprise."

Herbert River Flood, 1894.

Disastrous floods in the Herbert River are not unusual. In April, 1894 it was reported that the highest flood ever known in the river rose on a Saturday night and kept up till the following midday. Eight lives were lost for certain and others were thought to be drowned. The water was into Victoria and Ripple Creek Mills, but no serious damage was done. *Note.*—Unfortunately, this was not the last loss of life in Herbert River floods.

The Sugar Crisis, 1894.

The problem of the over-production of sugar was a worry to the sugar industry in 1894 just as it is to-day. Restriction of output was then being advocated as it is to-day, but it was recognised that this would not do much good unless the restrictions were general. Another proposal made was to feed cattle on sugar, but it was pointed out that this relief would only be temporary, because as soon as the sugar went into consumption prices would rise and cattle would have to revert to their former feed.

SIZES OF SUGAR FARMS AND PLANTATIONS, 1895.

Size.	Numbers.	Total Area.
2 to 5 acres	191	783
5 to 15 acres	434	4,378
15 to 30 acres	324	7,482
30 to 45 acres	170	6,463
45 to 60 acres	90	4,823
60 to 75 acres	37	2,530
75 to 90 acres	30	2,506
90 to 105 acres	15	1,488
105 acres and over	95	38,378
Totals	1,386	69,031

This gives an average of 49 acres per grower. The present day average is 41, showing that the smaller farmer has increased.

Marian and Pleystowe Mills, Mackay.

August, 1895.—"The Marian Mill has been duly opened with a grand invitation ball, cracking of champagne, and congratulatory speeches. It is now working on a crop of 22,000 tons of cane.

"The Pleystowe Central Mill is to commence almost immediately. It will only have a small crop of 9,000 to 10,000 tons of cane"

YIELDS OF SUGAR PER ACRE, 1893 AND 1894.

Place.	Tons. 1893.	Tons. 1894.
Logan	1·23	1·25
Bundaberg	1·71	1·50
Maryborough	2·18	2·09
Mackay	1·79	1·79
Ayr	1·84	2·57
Ingham	2·26	2·72
Mourilyan	1·36	1·49
Cairns	1·25	1·75
Averages	1·70	1·89

Export of Sugar to Canada.

Seven hundred tons of raw sugar were exported to Canada in 1895 from Queensland, and it was thought at that time quite feasible to push the consumption of Queensland sugar in Canada. In the 1898 Journal it was remarked that Canada had decided to extend preferential provision to Queensland.

A Retrospect, 1896.

The epoch of small mills and large areas of semi-cultivated lands is passing away. The small mills are now very few and far between; the large areas of semi-cultivated lands are rarely found in the Queensland sugar districts to-day. Instead of these we can now boast of some of the largest and most complete factories in the world; in our sugar districts are grouped round these mills the homesteads of settlers who have taken up cane culture. The change is a striking one. While there has been an increase of 33,000 acres in the area cultivated with cane since 1892, and while the output of sugar may be said to have practically doubled itself, the whole change has been for the benefit of Queensland and of Australia. It is so customary to associate the Queensland sugar industry with the presence of a large coloured population in our midst that it is worth noting that the number of Polynesians employed in the whole colony has fallen from 9,362 on the 1st January, 1891, to 7,853 on 1st January, 1895. White men working for themselves and using the best labour-saving implements are displacing the coloured workers rapidly. The large estates are rapidly becoming peopled with small farmers.

RESULTS OBTAINED AND COST OF MANUFACTURE OF FOUR CENTRAL MILL COMPANIES, MACKAY, 1895.

—	Pleystowe.	Racecourse.	Marian.	North Eton.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cost of cane per ton	0 14 0	0 14 8	0 13 7	0 14 0
Cane per ton of 88 n.t. .. tons	7·6	7·45	7·8	7·95
Cost of cane per ton of sugar .. £	5 10 9	5 8 6	5 10 3	5 18 3
Cost of manufacture per ton of sugar £	1 13 0	1 12 5	1 16 10	1 15 7
Cost f.o.b. Mackay £	7 12 8	7 15 9	7 19 9	8 11 7
Sugar made .. tons	715	2,251	2,099	2,078
Price received f.o.b., Mackay £	9 7 6	9 9 9	9 7 10	9 11 11
Net profit per ton £	1 14 10	1 14 0	1 8 1	1 0 4

Queensland in the Sugar World, 1896.

The "Journal des Fabricants de Sucre" quoted from the "Mackay Sugar Journal" that sugar would be placed f.o.b. Mackay, for £7 per 100 kilos, and added "Australian sugar is not yet on the world's market. That is well, but at the rate Queensland is developing her industry we shall not have to wait long for this new competitor. On that day the countries which still adhere to their old cost of about £14 will have seen their days as exporters!"

Hambledon Plantation, Cairns.

The Hambledon Mill and plantation was purchased in 1897 by the Colonial Sugar Refining Company from Messrs. Swallow Bros., the previous owners. It was stated in the "Mackay Sugar Journal" for June, 1895, that "the company desired to lease all the land and did not wish to cultivate an acre for themselves, and that hundreds of farmers were bound to flock to the Cairns district from the Clarence, Tweed, Bundaberg, Maryborough, and Mackay sugar districts, where increasingly impoverished lands and heavy frosts were bringing them to the verge of despair. On the Clarence and Richmond Rivers the sugar-growing industry is practically extinct, and the company were about to shift their mills from these rivers, for the farmers could not grow cane for them." This correspondent was a very poor prophet, as thirty-five years after his prediction the Richmond and Clarence Rivers are still growing cane, and the Colonial Sugar Refining Company has not yet shifted its New South Wales Mills to North Queensland.

PRICE PAID FOR CANE IN NEW SOUTH WALES IN 1898, BY THE COLONIAL SUGAR REFINING COMPANY.

% Obtainable Cane Sugar.	Price per Ton Cane.	% Obtainable Cane Sugar.	Price per Ton Cane.
	s. d.		*s. d.*
17·0	15 7	11·0	10 0
16·0	14 9	10·0	7 6
15·0	13 11	9·0	5 0
14·0	13 1	8·0	2 6
13·0	12 3	7·0	Nil
12·0	11 5		

Proserpine Central Mill.

The above mill commenced operations in 1898 and manufactured 1,350 tons of sugar from 545 acres, equal to a yield of about 2½ tons per acre. The writer of this paragraph says in the "Mackay Sugar Journal" for January, 1899, that the Proserpine district is nearly surrounded by mountains which give an exceptional rainfall, and prophesies that in a few years the mill would be kept working to its full capacity.

Comparison made in 1898 of cane yields per acre and tons of cane required to manufacture one ton of sugar. These were compiled by the Director of the Sugar Experiment Station, West Java.

Country.	Tons of Cane per Acre.	Tons of Cane to Make One Ton of Sugar.
Queensland	16	10·0
New South Wales	16	9·3
Straits Settlements	24	13·3
Java	36	10·0
Japan	15·2	14·3
Reunion	24·0	11·1
Hawaii	33·4	10·0
Spain	20·0	14·3
Louisiana	20·5	13·3
Egypt	22·0	10·0

Quantity of Sugar Produced from June, 1897, to June, 1898.

The following table is taken from the "Mackay Sugar Journal" for January, 1899:—

District.	Tons of Sugar.	Number of Mills.
Ipswich	300	3
Logan	1,537	11
Brisbane	921	2
Maryborough and Childers	14,336	8
Bundaberg	16,998	31
Rockhampton	805	1
Mackay	22,438	12
Proserpine	1,350	1
Lower Burdekin	6,213	3
Herbert River	16,255	3
Johnstone River	9,554	2
Cairns and Douglas	7,209	3
Totals	97,916	80

It will be noted that mills were then operating in the Ipswich, Brisbane, and Rockhampton districts.

Bounties on Continental Sugars.

The bounties granted by Continental countries on sugar manufactured by them were a very sore point in Queensland and other British sugar-producing places. In 1899 the following countries gave an export bounty on sugar, viz.:—France, Germany, Austria, Hungary, Denmark, Russia, and the Argentine Republic, thus unfairly competing with Australian-grown sugar, and wherever the English language was spoken a strong feeling was being manifested against the bounties, and in all parts of the Empire immediate and prompt action was being taken to countervail same. Mr. Chamberlain declared that the "Abominable bounties must come to an end," and influential papers in England were strongly advocating their abolition or a countervailing duty.

Note.—This bounty system got worse in the following years, and was complicated by a system of "cartels." Finally a big convention met at Brussels, and about 1903 both cartels and bounties were abolished.

[TO BE CONTINUED.]

PIN-HOLE BORERS OF THE WALNUT BEAN (*Endiandra palmerstoni*).

By J. HAROLD SMITH, M.Sc., Entomological Branch.

THE timber trade in any country passes through many phases before forest operations are planned in accordance with an ordered scheme inspired by an accurate knowledge of timber values, the purposes to which the several woods may be put, and the markets in which they can best be placed. In recent years, a growing appreciation of the walnut bean, *Endiandra palmerstoni,* for veneer purposes has focussed attention on North Queensland scrub woods. American manufacturers, keen to appreciate variations in the public veneer taste, found this timber of considerable value for the trade; hence during the past few years there have been considerable inquiries for this timber in the log, and some very heavy shipments have left the Cairns wharves for the United States. The early consignments were naturally viewed with a critical eye, for the characteristics of the wood were more or less unknown, and the most suitable technique for handling the logs from the stump to the knife had still to be formulated. A variety of the logs, cut in all sorts of ways and from a great range of trees, was shipped and milled at the discretion of the purchasing interests. Inevitably, certain criticisms were made by these interests on the nature of the wood supplied and the condition in which it was sent to the mill; hence subsequent supplies have been cut and shipped in closer conformity with the manufacturers' requirements when these had been formulated with any degree of precision.

One rather serious criticism concerned the activities of insects in the heart wood of some of the logs—in particular a pin-hole borer, which was stated to have riddled quite a number and made them useless for veneer purposes. Specimens of the insects were forwarded to the Forestry Board and referred to the Entomological Branch of the Department of Agriculture and Stock. Following a discussion of the problem, it was decided to initiate studies of the walnut bean insect fauna, and field work commenced in the summer of 1930-31. This progress report summarises relevant data procured to date, and discusses in some detail the implications on forest operations and other handling processes before the logs are finally milled.

The Properties of the Walnut Bean.

The walnut bean occurs irregularly through the mixed rain forests of the far north and has been logged principally from the rich scrub lands, just across the coastal range, between Innisfail and Cairns. Precise ecological information is slight, but some districts carry a relatively considerable stand, while others, apparently similar in every way, lack representatives entirely. Supplies have hitherto been culled from both private and Crown lands wherever the tree has been within reasonable access. The heart wood is deep chocolate in colour, and if feathered is highly prized for veneer, while even the normal log is of considerable value. Unfortunately, most of the logs show structural defects of one kind or another. Many are piped and the cavity may extend through the greater part of the log; some show ringshakes; fissures along the

line of the medullary rays are frequent, while minor defects such as bark inclusions are anything but rare. Consequently less latitude is permissible in the bench treatment than is usual when the American species is being cut. Where practicable, the log is quartered on the bench and the quarter cut flitch is the rule, being varied to meet the peculiarities of the logs, and in this form the flitches pass to the boilers preparatory to slicing. A certain amount of wastage is inevitable, the amount depending on the quality of the log, but the specifications now used by the Forestry Board permit the export of logs carrying not more than 15 per cent. of estimated waste in the total volume of the log. The bulk of the logs shipped would, however, carry less than 10 per cent.—quite an appreciable fraction when freight is taken into consideration.

A logging complication arises out of the fact that it is almost impossible to ascertain if a standing tree is structurally sound. Sounding prior to felling gives no indication of the nature or extent of existing defects, and trees must be cut on the offchance that logs taken from them will be marketable. Hence it often happens that trees of apparent dubious value prove to contain excellent veneer material when felled and *vice versa.* There seems to be no escape from this position as, for some years to come, all the walnut bean marketed will be drawn from virgin forests and shipments will include numbers of post-mature trees.

Significance of Insects in the Walnut Bean.

Though shot-hole and pin-hole borers attack both soft and hard wood scrub timbers at certain times of the year, the injury must be particularly severe to lessen materially their value for ordinary structural purposes. The walnut bean is, however, cut for a special trade in which insect injury to the heartwood is highly undesirable. As a rule Platypodids of shot-hole dimensions rarely pass beyond the sapwood of the harder scrub woods, in which group the walnut bean may be included. If they do, it is only under special conditions such as may be found where the fungi responsible for dozy heart are operating, either in the solid wood or on fissure surfaces. Hence from the practical point of view the field of interest may be restricted to pin-hole species known to affect sound heart wood (Plate 84). The first recoveries from exported logs incriminated *Crossotarsus grevilleæ* Lea (Plate 85), the smallest of Australian Platypodids, and subsequent work has confirmed the wider generalisation which makes this species the principal pest. The burrows are so small that they may not be observed if the flitches are cursorily viewed on the bench, but, of course, the defects show out clearly once the wood is sliced. Purchasers have claimed that losses through pin-hole borers have, in the past, been considerable, and this claim will be commented on later. Perhaps when logging was ill organised, inferior timber was shipped and there may have been some grounds for such complaints.

Nature of the Investigation.

An accurate survey of the borer complex in the walnut bean must necessarily precede any practical recommendations for the control of the pest. Hence some attention has been given to the study of the insects associated with logs after felling, the mode of attack which characteristises each, and the ecological conditions under which they work. For this purpose, logs have been felled on two forest reserves and the

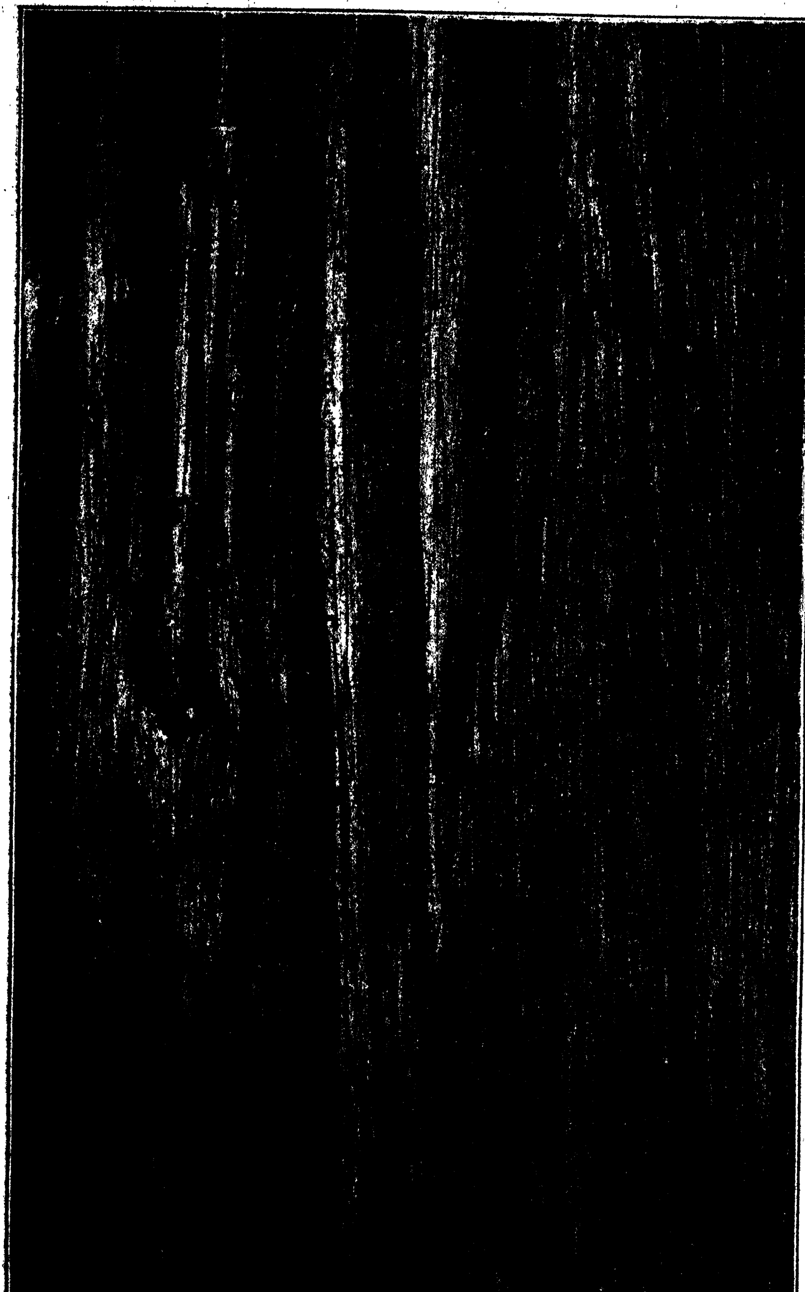


PLATE 84.

Crossotarsus grevilleæ Lea. Heartwood damage in walnut bean.

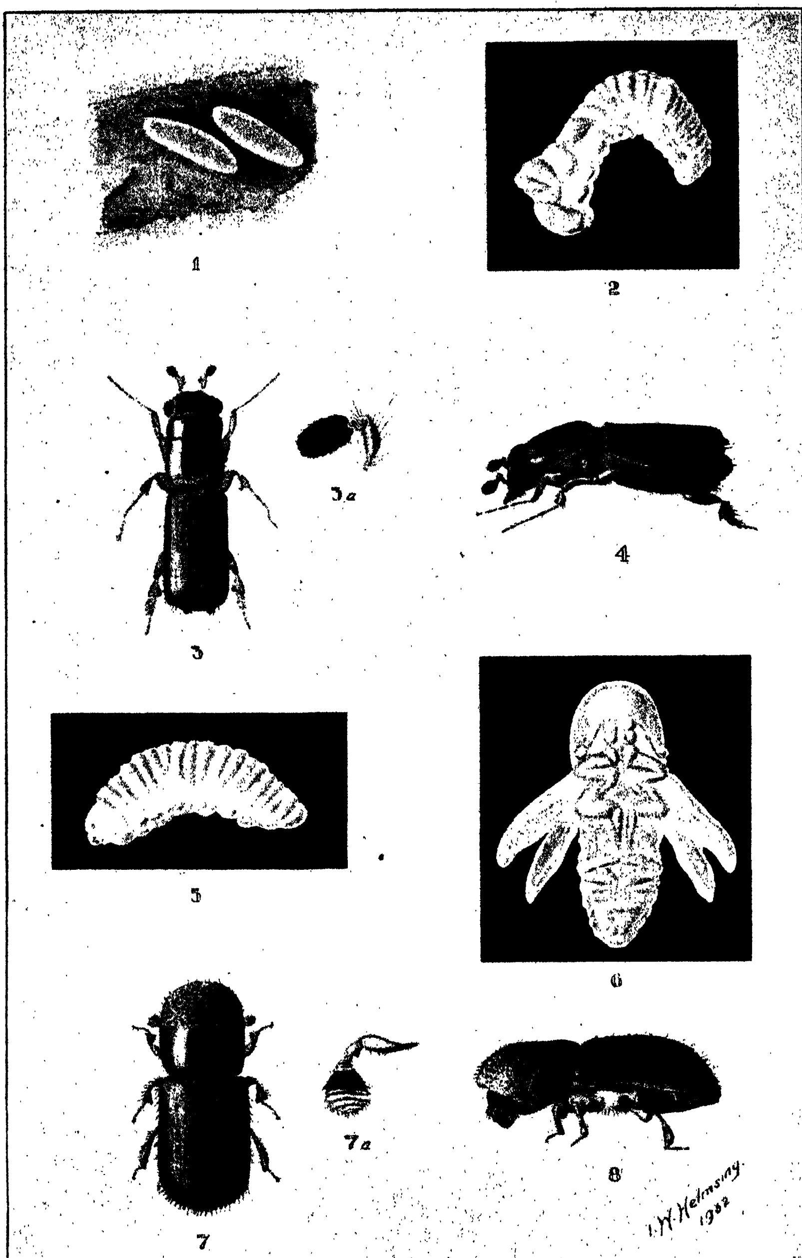


PLATE 85.

Crossotarsus grevilleæ Lea.

Fig. 1. Eggs × 34.
Fig. 2. Larva × 15.
Fig. 3. Adult (Dorsal View) × 15.
Fig 3A. Antenna × 60.
Fig. 4. Adult (Lateral View) × 15.

Xyleborus hirsutus Lea.

Fig. 5. Larva × 15.
Fig. 6. Pupa × 15.
Fig. 7. Adult (Dorsal View) × 15.
Fig. 7A. Antenna × 60.
Fig. 8. Adult (Lateral View) × 15.

insect activity in them followed through the early months of 1931, when the borer activities were at their peak. Sections of these logs were arranged in a variety of positions both in the scrub and outside in the open for comparison. The two reserves are at Wongabel and Gadgarra where resident foresters were available to carry out the work. The former lies near Atherton, on the dry end of the Tableland, while Gadgarra is situated closer into the range in a district of heavy precipitation. The rainfall at Wongabel was 21 inches for the first six months of 1931, while at Gadgarra 42 inches fell during the same period. In both places, the essential procedure was as follows:—From a tree cut in December, 1930, two 7-foot logs were sawn, one being hauled well into the scrub, while the other was dragged into the open where scrub influences on shade, humidity, &c., were less pronounced. Each of these was in turn halved, one section being left resting on the ground, while the other was raised on skids some 4 inches thick to permit adequate ventilation of the under surfaces. In late January, 1931, the sap wood was removed for a foot round the entire girth from the end of one piece, both in the scrub and the open, in order to expose the heart wood to direct lateral infestation, while strips of bark were removed from the upper surfaces as a check on bark influences in the insect fauna. Wood samples were axed from the logs at frequent intervals to provide material for closer examination than was possible in the field. Ants of the genus *Pheidole* played havoc with these during transport, but sufficient material was usually available to procure progress notes on the activity of the pin-hole species which attacked the wood.

Seasonal Conditions.

In North Queensland, monsoonal rains commence as a rule in late December and are preceded for some weeks by a succession of storms. Borers appear on the wing during the latter, and reach their numerical peak during the early months of the year. The summer 1930-31 was, however, quite unusual. November falls held promise of early general rains, but these failed to materialise until late in January; hence the logs encountered dry conditions for some three or four weeks after felling, at which stage the flight broods of the borer species were subnormal. Gadgarra rains for the first six months kept close to the average annual record, but precipitation at Wongabel was decidedly subnormal.

Insects Attacking the Walnut Bean.

Two pin-hole borers attack walnut bean logs shortly after they are brought to the ground in the summer months. One, *Xyleborus hirsutus* Lea (Plate 85), a typical member of the genus to which it belongs, has a wide distribution through the Eastern States, while the other, *Crossotarsus grevilleæ* Lea, is a Platypodid originally described from the southern silky oak, *Grevillea robusta*. More recent records of the latter species are all from the walnut bean, either as pests of the felled log or in the stumps and tops left in the forest after the logs are removed. A second species of *Crossotarsus* is of minor importance. The two commoner Platypodids of shot-hole size, *Platypus australis* Chapius and *P. omnivorus* Lea, riddle many of the scrub soft woods. The former, together with an unidentified species, shows some partiality for the sap wood of the walnut bean.

Development of the Attack.

When logs are left lying on the ground, changes gradually take place which have a considerable bearing on insect activities. If exposed to the sun, the bark quickly dries out and the shrinkage involves longitudinal splitting and the separation of bark from sapwood within a few weeks. Such changes take place normally when a log is hauled on to the ramp and left lying there for despatch to the wharf at a later date. On the other hand the humid and sheltered conditions peculiar to the depths of virgin rain forest preclude rapid drying out, hence a log left where it is cut for any length of time is subject to soaking and leaching rather than solar processes, and bark disintegration is consequently much slower.

In the experimental logs left in the scrub at Gadgarra, pin-hole borers soon alighted on the lateral surfaces of the logs and commenced to burrow. But, frequently as these burrows were initiated, they were invariably empty on examination at a later date, being for the most part but blind tunnels in the bark about one millimetre in depth. Scolytoid shot-hole borers, in contrast to the pin-hole species, penetrated through the bark to the sapwood without any apparent trouble. Marauding ants may explain some of the empty burrows of the pin-hole species, but it seems much more probable that the intact fresh bark hampers the normal propensities of the pests. The natural resistance to immediate pin-hole borer infestation through the bark steadily dimishes following leaching and exposure. Consequently, immediately after felling, only the ends of the logs are exposed to infestation, and there the attack is restricted to species of *Crossotarsus*. Both the heart and sapwood may be invaded at the ends of the logs, the entrance holes being scattered irregularly over the surface, but with the majority in the sapwood. There is no aggregation of burrows such as characterises shot-hole borer activities near the bark and in dozy wood tissues.

About the fifth week, the repellent properties of the bark diminished to a point at which the pin-hole borers could penetrate direct through the bark and the Xyleborid initiated the advance. Drippings from foliage overhead, heavy rain, and slow evaporation within the scrub were such that moisture had soaked through the weaker parts of the bark covering and caused some discolouration of the sapwood below. Traced back to their source, the older burrows led inevitably to these weaker parts of the bark. It would therefore appear that infestation by *X. hirsutus* follows closely the line of soakage through the bark. As the bark loosens at a later stage, other species may begin to operate more or less freely.

Once through the bark, *X. hirsutus* tunnels for some time on the surface of the sapwood in a tangential plane before entering the wood, hence where many insects of this species have been operating, the removal of the bark shows a superficial tracery made up of the preliminary hirsutus burrows. The direction of the burrows changes abruptly when the insect enters the sapwood, and this may subsequently teem with the tunnels of the insect. Both mature and immature forms may be found together in the same burrow.

A significant difference in the habits of *X. hirsutus* and *C. grevilleæ* may be noted here. The former enters the log only through the bark, while the latter must enter through an exposed surface, either a sawn

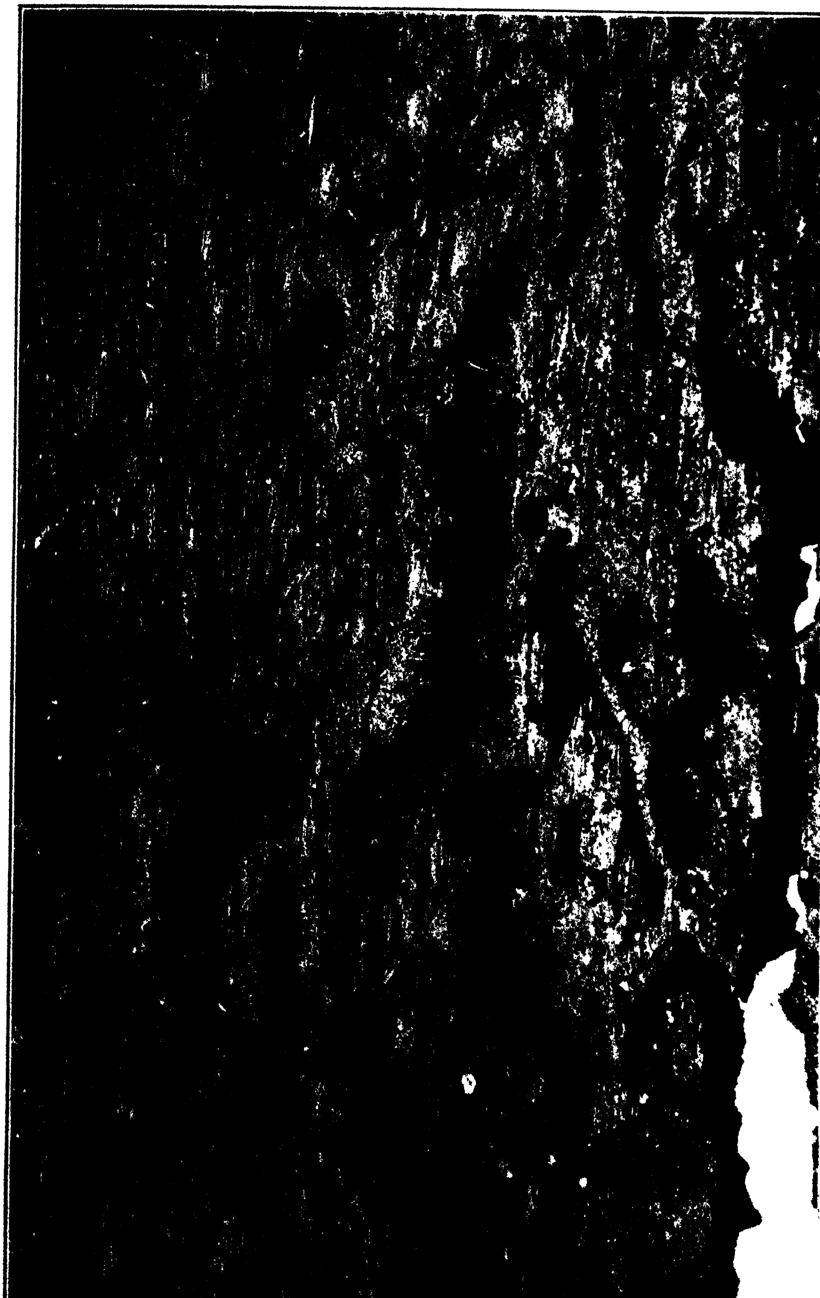


Plate 86.

Dysoperrhinus grandis Lea. Meandering bark burrows of larvæ.

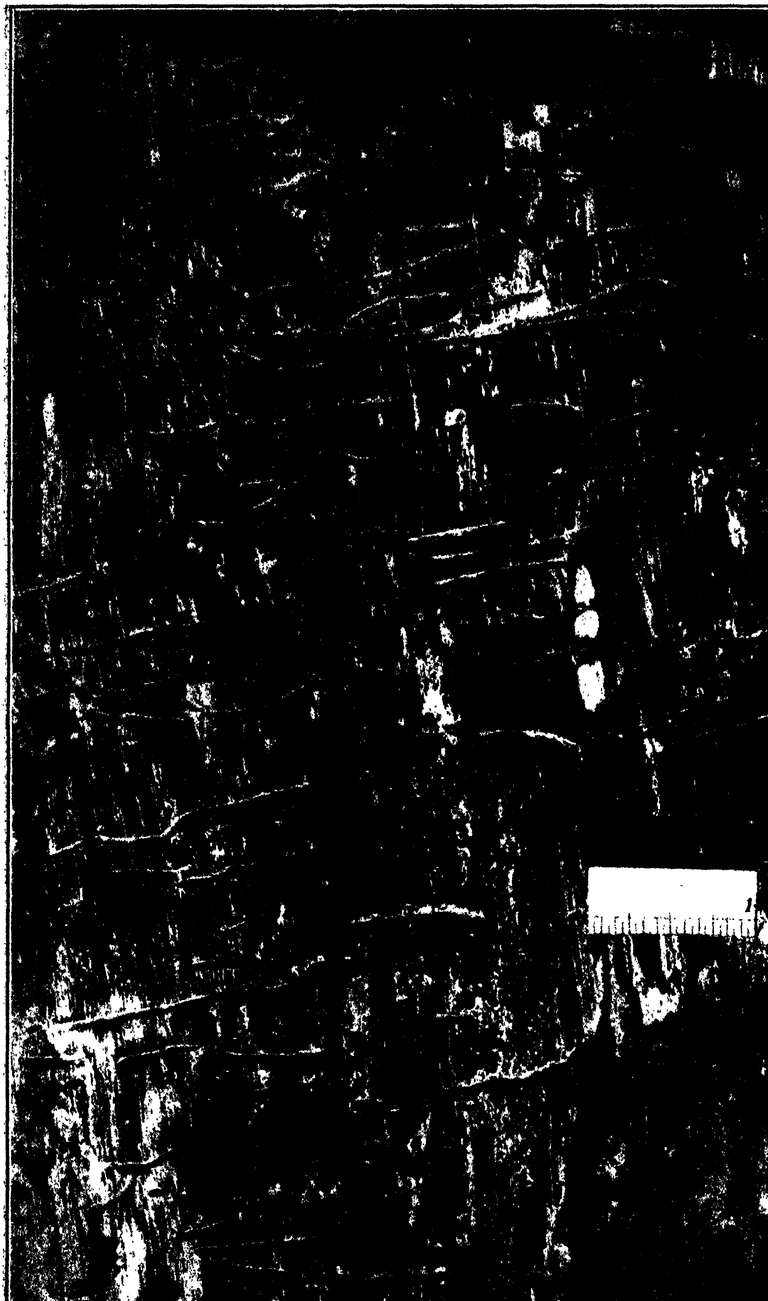


PLATE 87.

Xyleborus hirsutus Lea. Sub-bark preliminary burrows. Bark removed recently.

face or a scarfed edge cut with an axe. Ordinarily *C. grevilleæ* does not enter the lateral surface of the log until the natural shrinkage of the bark exposes the sapwood. Consequently, of the pin-hole species, the end penetration of the log is entirely Platypodid in origin. When the bark has been subject to scrub weathering for some time, *X. hirsutus* may penetrate the still intact bark. In the experimental logs the free use of the axe gave access to Platypodids at the sides of the samples earlier than would have ordinarily been the case.

One consequence of the succession was the intermingling of species within the log. In the early stages a pure infestation of Xyleborids was operating on the upper surface of the logs, but later both Xyleborid and *Crossotarsus* burrows occurred in close association. The adults, whose structural characters are, of course, distinct, can be readily separated, but larval identification is much more difficult and life history studies are therefore somewhat complicated.

In neither of the scrub logs at Gadgarra did the Xyleborid penetrate the heartwood, though the tunnels passed through the whole of the adjoining sapwood. Walnut bean does not possess the clear distinction between heart and sap woods, such as is found, for example, in the black bean *Castanospermum australe*. The transition is much more gradual, particularly if the tree from which the log has been cut is submature. Still the heartwood remains quite sound, and the value of the log for veneer purposes would not have been seriously impaired by the activities of the pest. The only material loss would have been that effected by *C. grevillea* at the ends.

Xyleborid penetration took place mainly on the upper surface of the two scrub logs. End penetration by the Platypodid was, by contrast, subject to no particular orientation. Skids made no appreciable difference to the infestation of the two logs, for undergrowth very quickly nullifies any beneficial effect which might be anticipated from aeration of the outer surfaces of the logs.

The two sections of the log out in the open permitted observations under an entirely different set of conditions, less suitable, theoretically, to the ecological requirements of the pin-hole borers. Both lay in an east-west position so that the sun played along the upper surface for the greater part of the day. The physical effects of exposure were soon evident in the loosened and split bark, both on the top and the sides. Borer damage was entirely of the Platypodid type, and entrance to the timber was effected only at the western end of a single log which possessed a fracture spur, sufficiently large to shelter the lower end surface from the sun. Here again there was direct penetration of the end wood by the insect, though the preference was mainly for the sapwood. The bulk of the effective entrance holes were on the lower half of the log.

Though entrance apertures of *C. grevilleæ* occurred in these logs, the burrows were either empty or harboured moribund adults, immature forms being quite absent. It is presumed that the solar heat is sufficient to prevent access of the insects during the day, while those which may effect an entrance during the night find conditions within the log quite inimicable to their general welfare. This aspect of the subject will be discussed later when practical control measures are being considered.

The duplication of the work at Wongabel confirmed the same general conclusions drawn from the Gadgarra material, with the noticeable difference that Xyleborids made no attempt to invade the logs—Platypodids being solely responsible for the borer injury. In any case, the infestation was slight in the scrub specimens and negligible for those left in the open. The tree felled at Wongabel was the younger of the two trees and should, under the same conditions, have suffered more severely than that at Gadgarra. The difference must therefore be placed to the credit of the variation in climatic conditions between the two areas.

Succession of Species.

During the leaching process which occurs in the scrub, another insect takes possession of the site between the bark and wood. This form was first noted in March, 1931, some three months after the trees had been felled at both Wongabel and Gadgarra, and by August the intact bark sheltered both larvæ and pupæ. The timber itself is unaffected, the tunnels being made in the bark and packed with the frass and wood debris associated with the activities of the insect, while the pupal chamber is cut very close to the outer surface (Plate 86). When reared the adult proved to be *Dysoperrhinus grandis* Lea. This insect has no apparent economic significance, but is of interest in the pest succession peculiar to felled walnut logs.

Life History Notes of Species.

The study of any particular species is a matter of some considerable difficulty, for material collected in the field invariably represents more than a single insect type. The range of insects in rain forests is so wide and the number of hosts suited to individual species so indefinite that laboratory work must preface any exact statement of the habits of any one form. This raises a further difficulty, viz., the handling of Xyleborids or Platypodids in the laboratory under conditions, which, no matter how well arranged, must differ from the natural habitat in some significant particular. The rain forest environment with shade, filtered light, humidity, even temperatures, &c., is hard to reproduce under laboratory conditions, while logs simply cannot be handled at all.

Hence the following observations merely throw together information gleamed from (*a*) The cutting up of 12 by 12 by 4 inches sections from infested logs cut at intervals for the examination of the insects enclosed, and (*b*) the implication of experiments, mostly abortive, initiated in the laboratory to elucidate particular points in the life history of the insects.

Xyleborus hirsutus Lea.

For the purposes of discussion, this is considered to be the only species of the genus handled in the experimental logs and in the laboratory. The adult (Plate 85, fig. 7) has typical Ipid characters, such as the ventrally placed head and short first tarsal segments, which make it readily separable from Platypodids, with a rectilinear body and long first tarsal segment. Where larvæ are working in conjunction, the two types may be distinguished by the brown dorsal loop on the prothorax of Platypodid larvæ (Plate 85, fig. 2)—a structure which is absent from the associated Xyleborids. (Plate 85, fig. 5.) These major distinctions

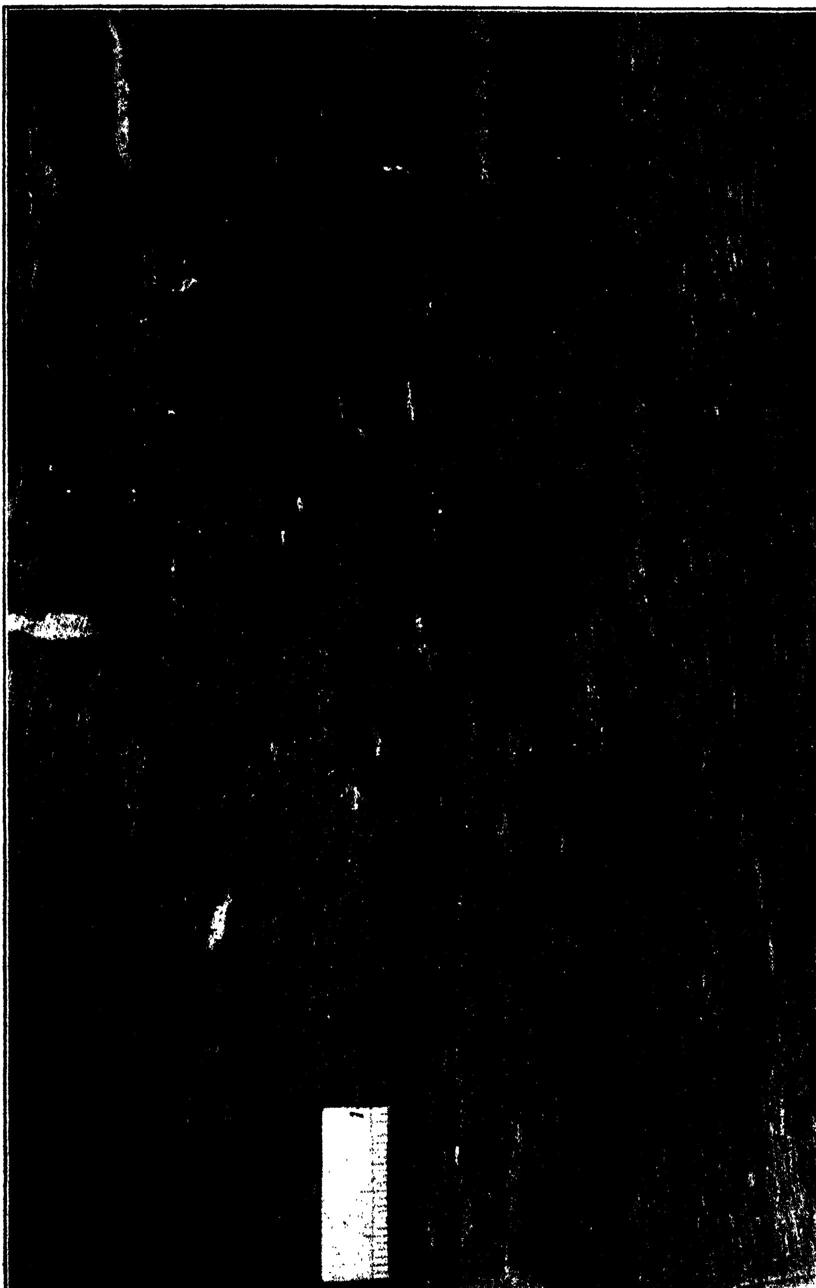


PLATE 88.

Indicating borer preference for leached sun crack.

PLATE 89.

Crossotarsus grevilleæ Lea. Showing damage in external surface, sapwood and heartwood.

between the two groups, while satisfactory for primary distinctions, must be viewed with some caution, for each group contains a number of species which may be working in the same log.

X. hirsutus enters the timber through the bark only and not on the sawn surface of the wood, but, even so, it seems very doubtful if the insects can bore through intact bark immediately the tree is felled. Preliminary soaking and leaching preceded successful attacks at Gadgarra, while even when the bark had been pierced, tangential burrowing took place before the sapwood was entered. (Plate 87.) Though Xyleborids are known to be partial to fresh wood in which the cell contents are still unaltered, it may be the peculiar property of walnut bean that certain changes must take place in the properties of the wood before the insects are free to tunnel in any and every direction. The tangential burrows of the insect possess few distinctive features. For the most part, they consist of simple meandering tracks changing direction abruptly at the point where the insect enters the log. A few are bifurcate, and some exceed an inch and a-half in length. Once the period of superficial burrowing is over, the insect enters the wood at an angle to the radial line and may pass through to the inner limits of the sapwood. Most burrows flatten out to a tangential plane before proceeding so far. Larvæ, pupæ, and adults may be found together within the one burrow.

Pupæ (Plate 85, fig. 6) were recovered from the tunnels in February, 1931, and in samples of wood examined later, both the immature stages were found throughout the burrows of the insect. The obvious inference is that more than one brood occurs during the wet season, though how many broods occupy the twelfth-month period is difficult to estimate. No signs of brood chambers in which larval development takes place have been found in either this species or the Platypodid.

Crossotarsus grevilleae Lea.

C. grevilleæ (Plate 85, fig. 3), the dominant species of significance as a pest of walnut bean, has certain characters which distinguish it from the Xyleborid so far discussed. The insect happens to be very common during the wet season and few, if any, logs cut at that time escape its attacks.

Infestation takes place on any surface where the wood is unprotected by the bark, hence imagines first enter at the ends of the felled log, mainly in the sapwood, but also to some extent in the heartwood. Should some of the bark be torn off during haulage with consequent exposure of the barrel of the log, or an axe ring be cut—as so often happens to secure official girth measurements—an entrance may be effected where the sapwood is exposed. Otherwise, so long as the bark remains intact, only the ends and fissures are affected, population of the remainder of the log being deferred until such time as exposure loosens the bark and allows access to the pest through cracks and abrasions.

As would be expected, the pest being the smallest described Platypodid, the tunnels are much more minute than those of the associated Xyleborids. The essential conformation of the tunnel is, however, much the same, brood chambers being absent while the entrance tunnel is also cut at an acute angle to the surface. For the most part, the pest

prefers the sapwood, but under suitable conditions, such as are common to the rain forest interior, the heartwood may be riddled by the burrows of this borer throughout the whole length of the log.

During the period when the experimental logs have been under observation, no pupæ of this species have been found, though they may be freely recovered from logs which have lain on the ground for twelve months or so. It would appear, therefore, that the life cycle of this species takes much longer than that of *X. hirsutus.* Perhaps this will explain the discovery of larvæ of *C. grevilleæ* in the heartwood of logs which have been exposed in the open for some considerable time, months after the outside of the wood exercises any attraction to the insect.

Contrast of Xyleborid and Platypodid Habits in Walnut Bean.

(*a*) *X. hirsutus* attacks the log through the bark only, while *C. grevilleæ* enters through exposed surfaces of the wood only.

(*b*) *X. hirsutus* has at least two and perhaps more than two generations per annum; *C. grevilleæ* appears to have no more than one.

(*c*) *X. hirsutus* does not penetrate the heartwood under normal rain forest conditions; *C. grevilleæ* may penetrate the heartwood.

(*d*) *X. hirsutus* cannot persist in the log for more than a few months; *C. grevilleæ* may infest logs for at least two years.

The economic significance of this information lies in the relative status of the two pests. Walnut bean for veneer purposes requires a heartwood free from defects—the condition of the sapwood is quite a secondary matter, consequently, control measures for borers in walnut bean must be specifically directed towards *C. grevilleæ,* the pest partial to the heartwood of the commercial log.

Feeding Habits of Borer Insects.

The tunnels of pin-hole borers in most species of timber have their walls discoloured through the action of various fungi which subsist on the wood which constitutes the walls. Should such tunnels lose their tenant, the mycelial development is so considerable that the burrows become blocked with a compact hyphal mass, often sufficiently strong to remain intact when the timber is broken up for examination. Prior to this stage, the fruiting bodies may be discerned fringing the walls of the borer tracks.

A number of fungi have been cultured, some directly from the fruiting bodies found on the walls, others from pieces of wood taken from the path of the tunnel. From the walnut bean, a species of *Monilia* has to be recorded, though the systematic position of the group is such that specific identification is impossible. Fungi assigned to this genus are usually considered to be imperfect stages of the higher Ascomycetes. A second fungus located in the pin-hole burrow belongs to the genus *Penicillium*, and the broom-shaped fruiting bodies almost touch each other in the centre of the tunnel. Many fungi of this type are saprophytic in habit, and this form may subsist on the debris inseparable from any insect habitation. The cultures were submitted to Mr. R. B. Morwood, M.Sc., Assistant Plant Pathologist, who is responsible for the identifications.

Pin-hole borers and shot-hole borers are usually classed as "ambrosia beetles," a name given to the group because some, if not all their members, feed on certain fungi specially cultivated for food on the walls of the burrows. More recently, it has been suggested that the larvæ of some species are essentially sap feeders, subsisting on the fluid contents of the wood rather than on special cultivated fungi. The biological requirements of the species under discussion are insufficiently known to warrant an opinion as to their habits. But either thesis must be viewed in the light of two facts—(*a*) That brood chambers are absent in both *X. hirsutus* and *C. grevilleæ;* (*b*) that fungi can be recovered from the burrows of both insects. The first would suggest non-specialised habits of the insects, while the second might indicate, especially as some of the fungi are unusual, that they have more than a mere accidental relationship with the insects which live in the burrow.

Borer Incidence and Logging Practice.

Under ordinary circumstances, logging is restricted to the drier months of the year, for haulage conditions in the scrub tend to hamper timber movements in the wet season. Hence, when the borer pests are most active—i.e., December-March—forest operations are almost at a standstill. This generalisation may, however, be varied if the overseas demand for walnut bean is sufficiently urgent. In the summer 1930-31, for example, such an inquiry in December prompted great activity in January, and the shipment when examined at the wharf prompted some misgiving, for borers, almost entirely of the grevilleæ type, infested the ends of most logs. It may be presumed that the losses when cut for veneer were not excessive and well within the limits imposed at the time of inspection by the forest officers concerned.

Considerable variations exist with regard to logging practices in the north. If fresh trees are felled when in a healthy growing state and hauled to the ramp for immediate shipment to their destination, the time interval during which the borers may work in a habitat suited to their needs is not great; hence the importance of such pests in the dry season is almost negligible. By contrast, initial infestation in the wet season may be high, though if the log is removed from the forest immediately, the scope of the attack is cut down to a minimum and the loss to the veneer manufacturer is slight.

In any large shipment of logs, a considerable number may be faulted structurally by such defects as piped stems—common in old trees affected with dozy hearts; ring shakes—a tangential fracture induced at the time of felling—and some others of less importance from the borer point of view. The significance of these two specified defects and a third, viz., ordinary longitudinal splitting, depends entirely on the fact that they give access to borers capable of attacking the heartwood through the greater part of the log. The structural defect may in itself reduce the amount of veneerable wood within the log, but should grevilleæ infestation supervene, following dumping where the insect can operate freely, the whole may be made valueless for this specific purpose. The importance of central infestation is enhanced by the fact that, while the development of insects penetrating the log from outside may be inhibited by solar influences, no such restriction is imposed on insects within the heart of the log. The obvious corollary is, of course, that logs with structural defects allowing access to the

heart wood of the timber cannot be safely harvested during the summer months—especially if some time has to elapse before the logs reach the bench.

Some years ago, when the boom demand for walnut bean swept over the Tableland, a number of logs cut from dying trees in the scrub or from trees left standing when rain forest was being cleared for pasture purposes, were shipped overseas. It has been suggested that the complaints of borer losses made by various buyers spring largely from these, and in this connection some generalisations from observations made during the course of this work may be made. Walnut bean trees of mature dimensions, standing in pasture land some fifteen years of age, now lacking sapwood and charred through the influence of successive grass fires, have been felled and found to have a heartwood free from pin-hole borer injury. Normally clearing and burning off would take place during the winter and spring months when the pest is least active, and the subsequent exposure of the standing trees would prevent wholesale invasion of the wood by pests of this kind. It is more probable that borer-infested logs have been brought to the ground and have lain under essentially scrub conditions prior to burning off. A healthy tree, dying in the open through the destruction of the adjoining timber, would not be itself attacked—exposure would be sufficient protection. The play of the sun's rays on the trunk would be sufficient guarantee against heartwood infestation by *C. grevilleæ*. At Gadgarra, a number of ring-barked trees have also escaped attack. The explanation is probably similar, as the surrounding scrub has been sufficiently thinned to materially alter the immediate environment of the standing timber.

During recent years, borer considerations have prompted the marketing of logs in a variety of ways—with bark intact (save for the strip removed for girth measurement), semi-desapped (with the sapwood partly removed), and totally desapped. The last method is discouraged, as sun cracks quickly develop in sufficient quantity to reduce the amount of available heartwood, though freight considerations prompt its partial continuance. From the entomological point of view, it will be clear that desapping is inadvisable, at least in the warmer months, for the bark itself acts as an efficient safeguard against grevilleæ infestation for some time after felling, while insects which may subsequently become established in the sapwood are there subject to solar influences. Timber handling must be essentially related to the habits of *C. grevilleæ* in any effective measures of control.

The source of borer logs in which the heartwood has been infested by the insects can be inferred from the previous discussion. If structurally sound, they must have been felled in the summer, when adults are plentiful on the wing, and allowed to remain in the scrub environment for some considerable time. If unsound, through ring cracks, piped stems, &c.—and most heart-affected logs are of this type—they will in all probability have been cut in the wet season, but may, or may not, have lain in the scrub subsequently.

The following conclusions inevitably are suggested as worthy of consideration in mapping out logging operations:—

(*a*) All logging should, if practicable, be completed during the winter months.

(*b*) If summer logging is imperative, only trees believed to be sound should be cut, while any shattered in the process should be disposed of locally.

(*c*) All logs should be removed from the scrub as soon as they are felled and placed in the open.

(*d*) The bark should be left intact as it affords protection to the log from insect infestation, and is also of assistance to the inspector in determining the probable age of the log.

(*e*) The ends of logs could well be covered with some repellent substance when cut to prevent end infestation by *C. grevilleæ*.

Inspection of Borer Infested Logs for Export.

The development of any export trade in walnut bean logs for specifically veneer purposes required that the Forestry Board should exercise some control over the quality of the shipments. At first, the purchasers, knowing little about the timber, apart from its value for veneer, were unable to draft specifications suited to the growth-habit of the tree and the logging conditions peculiar to North Queensland; hence the earlier shipments included a variety of logs many of which would be unsuited to the precise requirements of the trade through defects of various kinds. One such defect, about which much discussion has turned, incriminated the pin-hole borer as the cause of heartwood destruction, by which a number of logs superficially satisfactory actually milled into valueless veneer.

Subsequent official inspection of a more rigid type was therefore imposed, and a considerable number of condemned logs accumulated on the Cairns wharf over a period of two or three years. The reasons for the rejection of these logs were several, some on account of the structural flaws, and others because the borer infestation seemed more than was reasonable. Most of the logs showed some borer activities, some slight, others considerable. Some of these were purchased by the local saw-millers and passed through the bench for ordinary milling purposes. A number were examined when being cut, and after correlating the external borer-holes and the extent of the damage to the heartwood, there seems no doubt that the extent of the actual losses has been somewhat exaggerated. When the end infestation is considerable, the amount of injured wood determined by sectional planing may be of the surprisingly high order of 18 inches. This must be well above the normal, and presumes exceptionally favourable conditions for the activity of the insects. When the heartwood is entirely riddled, end, fissure, and pipe infestation play a share, the last two being the more important. The extent of pipe infestation may often be gauged when the flitches are being dressed, for slab after slab may have to be cut from the heart side of the flitch before sound wood is reached.

In considering suitable specifications for the inspection of export logs, much depends on the inspector's ability to sum up the probable insect losses in any given log. To do this he must be able to grasp the significance of structural defects in the log for the insect economy—in this case, *C. grevilleæ*—and the main considerations deducible from the data already given would be—

(*a*) That in sound logs, only the end infestation is of any great moment to the buyer.

(*b*) That in piped, ringshaked or shattered logs, the risk of heartwood infestation is high in summer but comparatively slight in winter.

(*c*) That the final injury is a measure of the original insect population—governed at all times of the year by the rapidity with which the log is despatched from the stump to the ramp and thence to the bench.

Logs have been shipped under various specifications in the past, all containing some reference to borers. Some required that logs be free from borers—an almost impossible standard—while others gave the inspector power to make any deductions from the timber measurements to compensate the purchaser for conjectured losses through the insect. Any valid inspection cannot but be based on the latter system, and the following criteria are suggested as a guide to inspectors required to issue certificates for walnut bean logs being shipped overseas:—

(*a*) Sound logs without end cracks, pipes or ringshakes, to be subject only to deduction for end losses if entrance holes of *C. grevilleæ* are visible in the heartwood. The maximum deduction should only be made during the summer months when the heartwood is clearly heavily infested. In winter the deductions may be reduced to negligible proportions.

(*b*) Cracked and fissured logs may be treated as sound logs if cut in midwinter, but deductions must be made during the summer if the logging history is unknown. Such logs should not normally be allowed to pass the wharf during the warmer months of the year.

(*c*) Only logs considered to have been felled specially for any particular shipment should be certifiable.

Summary.

(*a*) The walnut bean, *Endiandra palmerstoni*, has, during recent years, assumed an importance as a source wood for veneer manufacturers, particularly in America, but borer damage to the heartwood of some logs has been adversely criticised.

(*b*) The species mainly responsible is *Crossotarsus grevilleæ* Lea, a minute Platypodid. Its economic significance, its relationship to other insects which attack walnut bean, and the conditions favourable to its activity are enumerated.

(*c*) The relationship to logging practices is indicated, and stress laid on the need for expedition in forest operations.

(*d*) Information derived from a study of the life history of this insect and the associated *Xyleborus hirsutus* Lea, make possible specifications suited to the export trade.

Acknowledgments.

The suggestion for this investigation came from the Forestry Board, and the writer is indebted to its officers for collaborating in the work and introducing him to what is a rather complex industry. Headquarters staff have continually lent their aid in suggestions and a readiness to work through specialised material beyond his resources in Cairns. To these (in particular his Chief, Mr. Robert Veitch) he is very grateful.

SOILS.

By Dr. W. H. BRYAN, M.C., Lecturer in Geology, University of Queensland.*

THE subject of soils is one that should have a real interest for all Queenslanders. For, in a very literal sense, soils form the basis of our industrial life. Soils are more than mere collections of mineral particles. They furnish food and foothold for an infinite variety of plants, and these, in turn, provide sustenance for man and beast.

Ever since he first deserted the nomadic life of a hunter and settled on the land, man has been interested in soils from the point of view of their productivity. As a result of the trials and errors of thousands of years he has accumulated a mass of information dealing with this aspect of the subject. In recent years this knowledge has been supplemented by the work of scientists who in many parts of the world have been making a study of the *processes* which bring about the production of soils. This modern aspect of the study of soils is largely due to a group of Russian scientists. The huge extent of the Russian Empire, embracing as it does a varied assortment of geological, geographical, and climatic conditions, which are yet found in one continuous land mass, formed an excellent field for the study of the origin and formation of soils.

Soil Divisions.

Soils can be roughly divided into two great groups. The first group includes all those which have been carried to the position which they now occupy, through the agency of wind, ice, or running water, and which, therefore, bear no relationship to the underlying rock floor. These are known as soils of transportation. They include vast areas of valuable alluvial soil such as those in the valleys of the Nile, the Mississippi, and the Yang-tse-kiang. In Queensland they are well represented in our fertile river flats. Such soils are often of the very first importance from the economic point of view, but they do not throw much light on the way in which soils are produced.

The other great group is made up of soils formed in the places where they are now found, and which are, therefore, directly related to the underlying rocks. These may be called the sedentary soils, and it is with this group that I wish particularly to deal. The nature of these sedentary or residual soils must, in the early stages of their formation, be largely controlled by the nature of the rock beneath, but it is the belief of the modern soil expert that, in many cases, it is *climate* which is ultimately the dominating factor, so that, in the end, when the soil is at last mature, it may not resemble even remotely the rock from which it has been formed.

Composition of Soils.

Although most soils contain a smaller or larger amount of organic material, resulting from plant decay, they are essentially composed of substances derived from the rocks upon which they rest. The production of soil is brought about by two processes which may act independently, but which more often go hand in hand. The first of these processes results in the mechanical disintegration of the rock. As a result of purely physical causes, such as the alternate expansion and

* In a radio lecture from 4QG.

contraction during hot days followed by cold nights, the solid rock mass is gradually cracked and broken into smaller and smaller pieces. Such disintegration is a feature of deserts, the sands of which are composed of innumerable rock particles, each particle a sample of the unaltered parent rock. Consequently, these desert soils contain all the chemical constituents of the original rock, including those which are valuable as plant foods. The resulting fertility of many desert soils has been definitely established in those places where the lack of rainfall has been remedied by the introduction of irrigation schemes. There the promise is fulfilled, that "The desert shall rejoice and blossom like the rose."

If we turn now to the other important soil-forming process we find an interesting contrast. This second process is a purely chemical one, and brings about the decomposition of rocks, by a series of chemical reactions. The net result of these reactions is to dissolve out, and carry away in solution, many of the original substances composing the rock. This process is known as leaching, and it includes the removal of those elements which provide the mineral foods so necessary to plants. As these reactions need the presence of water, they are most potent in regions of heavy rainfall, and since increase in temperature accelerates them, rock decomposition is most marked in the humid tropics. If carried to the limit, this leaching results in the production of the so-called laterites, which are incapable of supporting any but a poor vegetative growth.

In these two extreme cases that we have considered, we have the seeming paradox that wonderfully fertile soils may be produced in the inhospitable desert, while barren soils may be formed in the heart of the luxuriant tropics. But the great majority of soils lie between these extremes, and are the result of mechanical disintegration and chemical decomposition acting hand in hand. Under these conditions the original rock masses are partly broken up and partly leached. If the leaching has been comparatively slight, the soil may still resemble the parent rock very closely. Such soils are termed skeletal. Since they bear such a close relationship to the underlying geological formations, it follows that a geological map of the area may be used as an accurate guide to their distribution. The sandy soils found on the granites of Southern Queensland afford good examples of these skeletal soils.

If chemical decomposition has been relatively more important than mechanical disintegration, the fact may show itself in one of two ways. In the first there results the removal of certain constituents from the whole thickness of the soil, as, for example, in the leaching of lime from many of our red volcanic soils in coastal Queensland. The second shows itself by the removal of constituents from the upper part of the soil, and their redeposition, and accumulation in the lower part, thereby bringing about two or more definite soil layers, or horizons. The upper of these corresponds to what is popularly known as the soil, and the lower to the subsoil. Right along the coastal strip of Queensland soils of this type are commonly developed. Usually the upper layer is light in colour and of a somewhat sandy texture, while the lower layer is darker and of a more clayey nature. In some cases this lower layer contains many small ironstone nodules, and occasionally, when these are numerous, they are cemented together to form a hard rock-like mass, known as a hard-pan.

Overshadowing Factors.

From a consideration of those facts that we have already dealt with, it is plain that, while many things may influence the nature of the soil formed in any particular place, there are two all important factors that overshadow all the others. These are the nature of the parent rock and the climate. The influence of the former is shown, for the most part, in arid regions and in young, immature soils, but, in addition, there are certain rocks, particularly those composed of a single mineral, which, by their very nature, are capable of giving rise only to a very restricted range of soil types, no matter what the climate may be. Thus a pure sandstone made up entirely of quartz grains would always produce a sandy soil. Hence certain sandstones produce the same barren soil in whatever part of Queensland they are found. On the other hand, a pure limestone could never give rise to such a soil. Most rocks are, however, composed of a number of different minerals, and, consequently, such rocks are all capable of giving rise to quite a wide range of soils, according to the climatic conditions governing their decomposition. Thus the basalts of Southern Queensland give rise to two distinct soil types, which differ in colour, texture, lime content, and the natural vegetation which each supports. The first of these is a black soil, which is typically developed on the Darling Downs, although it is found in many other parts of Queensland. This is a fertile soil, rich in plant foods. It shrinks amazingly in the dry weather, and develops great gaping cracks. After rain the soil swells rapidly and forms a black, tenacious clay, detested by motorists. It has become so usual to associate sticky clay soils, with black colour, that the name "Black Soil Plains" has been given to many areas in Central and Western Queensland, where the soil, though tenacious, is *not* black in colour but is some shade of brown. The other volcanic soil derived from basalts in Queensland is a deep, chocolate-coloured, or red, clay loam, which, in its native state, usually supports a luxuriant jungle growth. This soil, too, is largely composed of clay, but it is a clay with distinctly different properties from that of the black soil. It does not shrink and swell to nearly so great an extent, it is more friable, and less sticky, and it drains much more rapidly. It is not so rich in mineral foods, and in some cases is soon in need of lime. The similar red loamy soils about Brisbane are often referred to as volcanic soils. In some cases this is wrong, for a number of these soils have not been formed from basalts or any other volcanic rocks.

The influence of the climatic factor tends to develop, as nearly as may be, the same soil type under any one set of climatic conditions, irrespective of the rocks present. This is best shown in areas where the soils are very old and mature and where there are no extreme rock types present. For example, in Russia climate is so much more important than the geological factor that the soils are arranged in broad belts, which correspond quite closely to the several climatic zones, but which, seemingly, bear no relationship to the distribution of the geological formations. Thus the well-known Black Earth, famous for the wheat it produces, and similar in many respects to our own black soils, extends as a belt for thousands of square miles and is wonderfully uniform, although it overlies several quite distinct geological formations.

Another interesting example of climatic control producing the same soil type from two quite different rocks is furnished, when we compare the famous Cuban soil, known as the Matanzas, with the red soils of our

coastal regions. As a result of the two soils having been formed under similar climatic conditions, they are very similar in colour, texture, and other physical and chemical properties; they each support luxuriant rain forests in their native state, and are each ideal for the growing of sugar-cane, but, while the Cuban soil is formed from a limestone, the Queensland equivalent is formed from a basalt.

As a result of the interaction of innumerable rock types with varying climates there are, between the skeletal soils on the one hand and the fully leached soils on the other, a host of soils of many kinds, some of which may still show the mineralogical characters of their respective rocks, while others show signs of the more important influence wielded by climate.

This complexity is still farther increased by the introduction of a third factor, namely, physiography. In places where the topography is uniform over large areas, as, for example, on our western plains, soil variations due to this factor are negligible, but in the coastal highlands it is often very important. Change in elevation, or in aspect is usually accompanied by very local, but nevertheless important, changes of climate. Consequently, the same rock may give rise to quite different soils on an exposed ridge or in a sheltered valley. Physiography, too, controls largely the nature of the local drainage, and this, in its turn, must have far-reaching effects on the soil-forming processes. The interaction of all these factors can be well studied in the Brisbane area, for in and about the city and suburbs there is developed a wide range of geological formations, and the area is, in addition, one of considerable physiographic complexity.

MILK AND MAN.

The Arabs of the Sahara reckon their flocks most valuable property. They drink the ewes' milk regularly. Like the Syrian sheep, the Arab sheep are very prolific, generally lambing in spring and again in autumn. These two breeds are probably closely allied one to the other.

Captain Burnaby, in his book "A Ride to Khiva," says that "sheep make up the entire riches of the nomad tribes. A Kirghiz lives upon their milk during the summer and autumn."

Ewes fill the place of cows in Iceland, as many as 1,000 being kept by large farmers. They run on the hills during the summer, and are housed during the long winter.

Mare's milk plays a large part in the diet of Asiatic peoples, who rear large numbers of horses. Marco Polo, the Italian traveller of the thirteenth century, has recorded of the great Asiatic prince, Kublai Khan, that he kept over 10,000 pure white horses and mares, the milk of the latter being reserved for the Khan and his household, and the members of one great tribe who enjoyed the privilege of drinking it as a reward for military services rendered.

Asses' milk has been used from a remote period for human consumption. It was esteemed by the ancient Romans, and there is a certain demand for it in London at the present day for invalids' use.

Among other domestic animals used for milking purposes are the buffalo, employed for draught and plough in various parts of Asia and in some parts of South-Eastern Europe; the yak, used as a beast of burden in Tibet, whose milk is very similar to that of the cow, and is used also to make butter and cheese; the camel in Egypt and many parts of Asia; and in the Arctic regions of Europe and Asia the reindeer, upon which the Samoyedes and other nomadic tribes are dependent for their existence.

TOMATO CULTURE.

By Officers of the Fruit Branch, Department of Agriculture and Stock.

In recent years the production of tomatoes has materially increased, but taken as a whole it is doubtful whether the increase is proportionate to the larger area under this crop. Various factors have operated against the continuance of high yield, of which constant cropping of the same land is not the least important. The lack of efficient soil treatment, the introduction and establishment of disease in addition to such as may have already been established, and frequently insufficient attention all militate against high averages. It must also be admitted that the land cropped is not always of a nature best suited for tomato culture. These matters and points on grading and packing are discussed in these notes, which have been revised and added to by Mr. J. H. Gregory, Instructor in Fruit Packing.—ED.

SOIL REQUIREMENTS.

A FINE alluvial loam with good fertility and efficient drainage is considered the most suitable, though excellent crops are also obtained from basaltic soils. Continuous cropping of the same land is not in any circumstances recommended; in fact, alternate sowing with green crops to plough into and maintain the supply of humus in the soil are necessary and will, in addition to maintaining the desired element in the soil, assist in retaining such fertilizers as are applied. Whatever green crops are used, the choice of variety depends upon local conditions. It should not be subject to eelworm or nematodes; therefore cow pea could not be recommended.

Maize sown broadcast and fairly closely provides a liberal supply of vegetable matter and is now receiving more general attention in this line. It will be found advantageous to apply the necessary fertiliser before planting the green crops so that a luxurious growth may be ensured; the fertilizing elements which have been absorbed by it will be returned to the soil when it is ploughed under.

Ground that becomes sodden in wet weather becomes rapidly hard and dry after rain. Where a small plot, generally referred to as a soak, exists it may, according to the situation, be worth while draining it with agricultural pipes, but draining large areas is not profitable.

Good preliminary cultivation is most essential. Land which has not been under cultivation previously or is deficient in any or all of the plant foods should be liberally fertilized. Unfortunately, farmyard or stable manure is rarely available in sufficient quantity (its deficiency is responsible for much ploughing under of cover crops to provide the necessary mould); consequently other fertilizing material must be applied, and the following formula is recommended:—1 to 1½ cwt. sulphate of ammonia, 5 cwt. of superphosphate, and 1½ to 2 cwt. of muriate (or sulphate) of potash per acre. These should be thoroughly mixed, spread evenly over the soil, worked into, and thoroughly incorporated with it.

Planting.

Planting is usually done in rows and the plants subsequently allowed to grow at will, practically covering the soil surface. Staking with or without wiring is seldom practised, the extra labour not being considered warranted, but this is open to question, particularly where the available land is limited. The distance between plants ordinarily varies according to soil and local conditions from 4 feet to 8 feet, or even more according to local conditions. Where grown with the aid of stakes (with or without wires) they may be planted 18 inches to 2 feet apart, and 3 feet between the rows. The plants are trained to a single stem from the outset, all laterals being removed close to the stem without injuring the main foliage and the terminal bud removed when the height of the support has been reached, the plant being trained vertically; all parts are accessible to applications against fungi or insect pests. Where stakes are plentiful and light, one to each plant is used, 4 feet to 5 feet being allowed above the ground level, the plants being tied to them in three or four places before reaching the top. By the use of fairly heavy posts sunk well into the ground at distances of about 30 feet apart wire may be used. These may be kept in position by "droppers" reaching a short distance into the soil. The advantages of this system are that clean cultivation can be much more readily

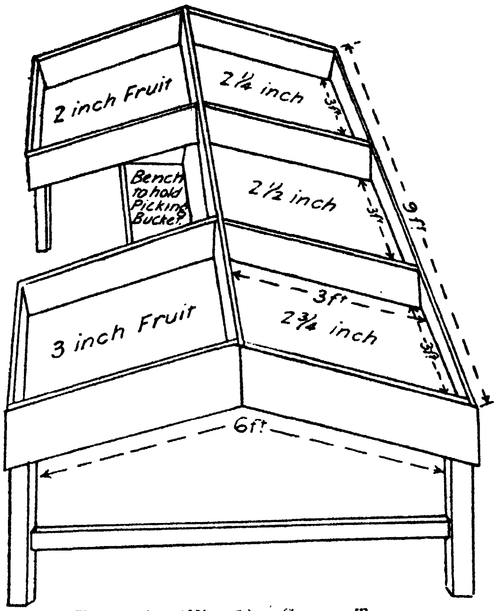


PLATE 90 (Fig. 1).—SIZING TABLE.

Diagram of sizing table containing bins for five sizes of tomatoes, and a space with bench built in to accommodate sizing hand.

Note.—This table should not be made too big, as this will cause rough handling of fruit.

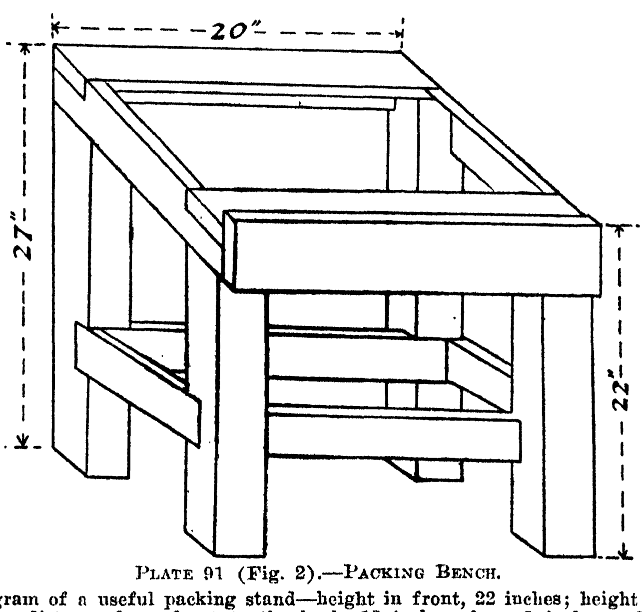


PLATE 91 (Fig. 2).—PACKING BENCH.

Diagram of a useful packing stand—height in front, 22 inches; height at back, 27 inches; distance from front to the back, 18 inches; legs, 3 inches x 3 inches; stays, 3 inches x 1 inch; front board, 5 inches x 1 inch. This stand should be made wide enough to hold two cases, thus permitting two counts to be packed at the same time from the sizing table.

practised; moisture is retained by lightly working the surface soil, and where necessary attention is given, practically no losses from blight nor caterpillar, also very much increased yields, in some instances over 100 per cent., are recorded.

Varieties.

As to varieties, preferences differ in every district, and no list of suitable varieties for all districts can be submitted. This is particularly instanced in the wilt-resistant properties claimed for Bowen Buckeye in the district of its origin, while under trial with a collection of other kinds a Hawkesbury proved to be the most susceptible to the disease. Growers have been advised repeatedly to save their own seeds from selected plants showing a combination of vigour, productivity, and even-shaped fruit of medium size. Excessively large fruit is generally prone to irregularity in shape, is seldom so freely produced, and for general purposes is not so much in demand as fruit of medium size. It is disappointing to note how few have accepted this advice, and it is a common practice to purchase imported seeds and to a lesser extent import seed direct from overseas. To lack of discrimination in this respect, the wide distribution of the ills which beset the plants are in a great measure responsible. As the tomato thrives so vigorously in this State it is reasonable to assume that an all-round improvement could be effected by selection, for it will be noted that odd plants in a plot show marked advantages over others in their vicinity.

Much has been said in favour of the wilt-resistant varieties, among which Norton has not been superseded. Such varieties are, however, not so widely sown as one would expect, and the inference is that they are not considered as profitable as those for which no such claims are made.

Raising the Plants.

Diversity of opinion exists as to the advantages of planting the seeds in the position where the plants are to remain. The practice may present disadvantages in districts of light rainfall, but under ordinary conditions it has a most important feature to commend it. In transplanting, no matter how careful the operation, many roots are broken, and where such breakages occur an opening is made for the entry of injurious bacteria. Where seed-beds must be provided, the same site should not be used for two seasons in succession.

Shade is sometimes necessary to secure even germination, and this can be obtained by the use of straw, or even bags laid upon the ground in which the seed is planted, the covering being removed as soon as the young plants begin to appear through the soil. Before planting the seed the soil should be reduced to a fine tilth. That is important. Following planting the soil should be firmed either by beating with the back of a spade or shovel or completely treading it. A fine light layer of loose soil should then be scattered over the surface. In the absence of firming, the soil will frequently dry to a sufficient depth to prevent germination, even when watered daily.

Plants grown close together as seedlings in the seed-bed usually draw freely on the available moisture, and if this is not present make poor growth. An even and adequate supply of moisture is therefore necessary to develop robust plants, but for a day or two prior to transplanting (unless it should be during showery weather) watering should be entirely suspended.

In the field the land should be well prepared; deep working will assist the plants to withstand dry weather, and cultivation while it can be practised (throughout where staking is employed) will also materially help.

It is, unfortunately, a rather common sight to see rejected fruit scattered over the field, where it decays, and in the process provides a medium for the development and spread of diseases and pests. Instead of the old stalks, and as far as possible the foliage, being collected and burned as soon as the plants become unprofitable they are left until some later date and then more or less ploughed into the soil.

MARKETING TOMATOES.

Much has been written on the subject of marketing different fruits, but the essential facts are still the same; grading, sizing, packing, and an attractive get-up to the finished package are the things that count. The grower must study the needs of the consumer, retailer, and agent to get the best price for his product.

Consumers want tomatoes of good quality and in a condition that will induce them to buy more, so increasing the demand and disposing of greater quantities. Immature, small, or grubby fruit are not appreciated, and many of the householders getting fruit of this description from the retailer cease to buy tomatoes for a week or so, thus causing an over-supplied market, with the consequent drop in prices

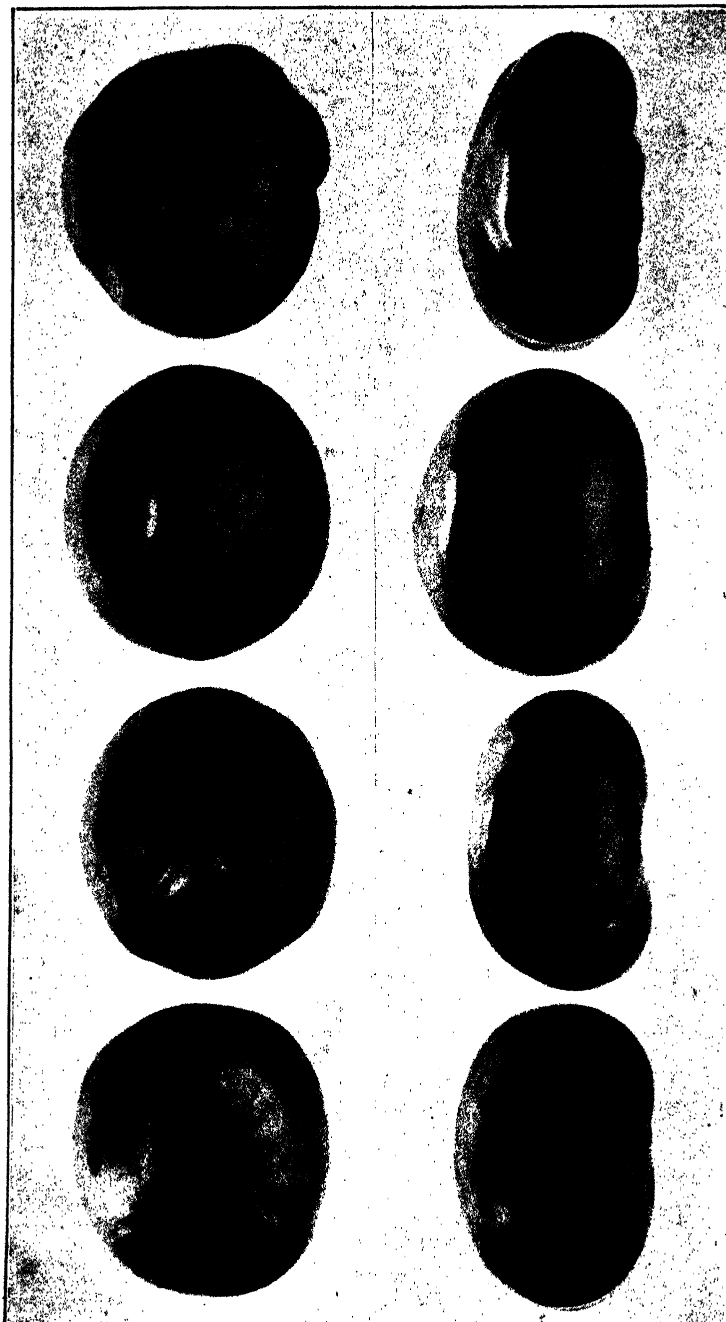


PLATE 92 (FIG. 3).

Four specimens of tomatoes photographed on edge and on the flat, showing the uneven layer which would be obtained with tomatoes packed on the flat, and the even layer obtained by placing the fruit on its cheek as is done when using the Standard Cheek Pack.

These were four tomatoes taken from a case in the market measuring 2⅝ inches in diameter.

Retailers require tomatoes of a uniform quality to enable them to sell, if possible, 100 per cent. of good, sound, unblemished fruit, thus satisfying their customers and keeping up a demand.

Growers should remember that a good agent to handle their fruit is necessary, but the more important thing is to give a good agent good fruit to handle. Once the market receives bad fruit the demand ceases, prices drop, and agents then have difficulty in getting payable returns for the grower. Buyers will pick out the best packed and graded fruit, causing the grower of badly graded and packed lines to lose on his consignment. The advantages of good packing and grading are very pronounced on a slow market.

Grading.

With tomatoes, grading usually is the worst carried out operation, growers as a rule mixing all sizes and colours. We know that at the start of a season, owing to the small quantities of fruit ready to harvest, it is hard to separate all grades into separate cases, but this is an easy matter when the season is in full swing. Retail buyers and agents want fruit packed true to size and colour; fruit of a uniform size being either all green matured fruit fit for country orders or ripe fruit suitable for city and suburban trade. Growers in remote districts may possibly find difficulties in landing their tomatoes in perfect condition as regards colour on distant markets, but big improvements can be made by these growers. One sees in the markets fruit from distant districts almost totally green throughout the case, but having, perhaps, a dozen to twenty ripe or nearly ripe fruits in the case. A case of this description of pack is of no use to any buyer. If bought for country trade, the ripe fruit would be found running out of the box on arrival at its destination, and not being ripe throughout the case it is of no use for a city or suburban buyer. Some growers reverse this practice by having ripe tomatoes with a few green specimens included. Another bad fault is the packing of immature tomatoes. Many growers in trying to catch early markets pick before the fruit is mature, so giving it no chance to even ripen properly. The public, through buying immature fruit at the start of the season when prices are high, is turned against tomatoes with the consequent causing of the marketing troubles mentioned previously. Any immature fruit that may be packed by accident should be rejected when packing. Diseased, blemished, and cracked fruit should not be included; one or two specimens of this description lowers the value of the whole case.

Sizing.

For the successful packing of tomatoes sizing is absolutely necessary, and must be done before proceeding to pack. It is possible with citrus, apples, or pears to pack without sizing first, but with tomatoes it is essential to size first. At present we do not know of any sizer that is a complete success for sizing tomatoes, but the revolving roller and moving belt type of appliance is a big help. The best method for the grower with a small acreage is a sizing table, a diagram of which is shown (Fig. 1). This can easily be made at home. It is necessary to have the centre raised to allow the fruit to run to the edges of the table where the packers are working. This saves reaching for fruit. Packing operations are conducted from the sides of the bins or compartments of the table. To save throwing or rough handling on the part of the operator sizing the fruit, it is advisable not to make the table too big. Benches 3 feet by 3 feet are a good size; this would mean a table 9 feet long by 6 feet wide. There are five compartments for sizing, the space in the middle at one side being used by the sizer to stand in whilst sizing. A bench for standing the packing bucket on is a great convenience and time saver—allowing the sizer to use both hands for operations. Best results will be obtained where it is possible always to have the sizing done by the same person, who will soon become very fast and expert.

A packing stand to hold two cases can also be easily made (Fig. 2). Packers are advised to pick two sizes together from each bin.

Packing.

Many and varied are the ways one sees the operation of packing carried out. Flat packs, solid packs, and square packs all have their supporters, but the standard cheek pack with its pocket system has all the advantages; easy to learn and easy to do when following on the sizing operation, and all sizes will pack correctly. The most popular box for marketing tomatoes is the dump half bushel 18 inches by 8⅝ inches by 7½ inches, but some growers use the half long-bushel case with a partition 26 inches

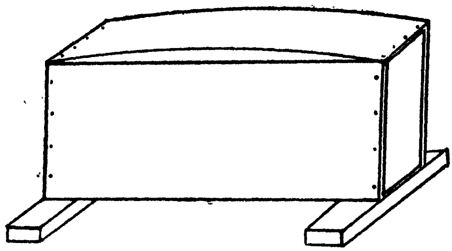
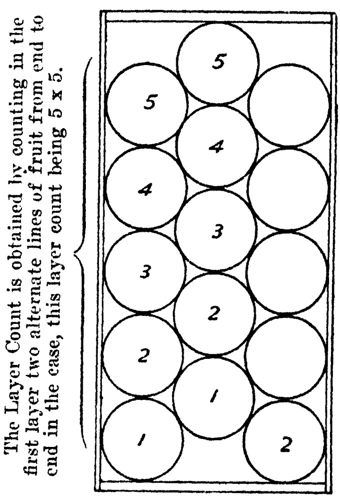


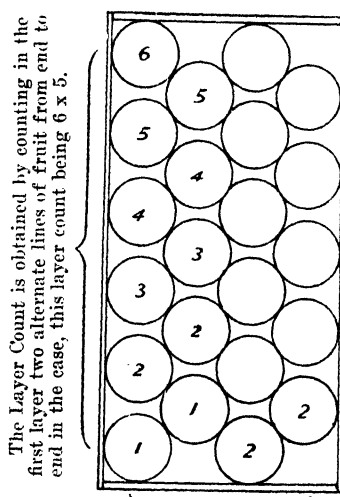
PLATE 93 (Fig. 4).—NAILING DOWN.

Method of placing two pieces of timber on the floor of shed. This makes a good solid nailing down bench, and permits the bottom of the case as well as the top to bulge slightly when the lid is nailed on.



2–1 PACK.

The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

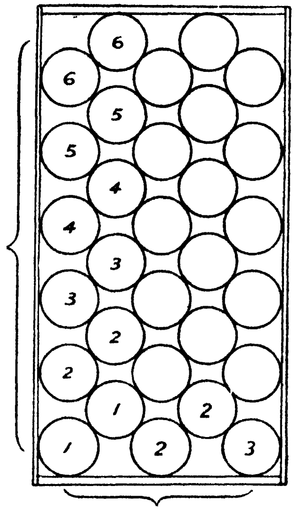


2–2 PACK.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

PLATE 94.

The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 6.



3–2 PACK.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

PLATE 95.

by 6 inches by 7½ inches. The advantages of the dump half bushel are as follows:—Easier and quicker to make up through having no partition, a better shape for handling, stacking, and carting, and, being wider, easier to pack into—allowing a packer more room to work with greater speed. Its shape also lends itself to displaying fruit to better advantage. Some packers make the dump half-bushel case the narrow way 18 inches long by 7½ inches wide by 8⅝ inches deep (Figs. 11 and 12), but with the flat type of tomato making it the broad way 18 inches long by 8⅝ inches wide by 7½ inches deep is to be preferred—allowing more room to work in, and giving fewer packs and counts (see packing tables), with greater ease in sizing. It also has fewer sizes that give trouble to the beginner in getting fruit up to the correct height in the case. The best plan is, where possible, to pack the tomatoes over-night, nailing them down and despatching the next day. Round type tomatoes pack easiest when cases are made the narrow way.

By studying the illustration (Fig. 3) of the four specimens of tomatoes shown on their cheek and on the flat there will be seen one of the great reasons why we use the cheek pack in preference to the flat pack. By placing fruit of a given diameter, which is the system of sizing used commercially, we get an even, level layer, but by placing fruit on the flat we get uneven layers to pack on, which greatly increases our difficulties in bringing the case up to an even face for lidding or for display purposes. It would also be impossible to have standard packs and counts if using any system but the standard diagonal cheek pack. Once a type of tomato of a given diameter is packed correctly the same type and size will always pack correctly and give the same count by using the same pack.

PACKS THAT WILL BRING FLAT TOMATOES TO THE CORRECT HEIGHT IN THE DUMP HALF-BUSHEL CASE.

In cases made on the wide system (Fig. 8), 18 in. long, 8¾ in. wide, 7¼ in. deep.					In cases made on the narrow system (Figs. 11 and 12), 18 in. long, 7¼ in. wide, 8¾ in. deep.				
Approx. Size.	Pack.	Layer Count.	Number of Layers	Total.	Approx. Size.	Pack.	Layer Count.	Number of Layers.	Total.
	3–2	9–9	4	180		3–2	8–7	6	225
	3–2	9–8	4	170		3–2	7–7	6	210*
2¼	3–2	8–8	4	160		3–2	7–6	6	195*
	3–2	8–7	4	150		2–2	9–9	5	180
2½	3–2	7–7	4	140		2–2	9–8	5	170
	3–2	7–6	4	130	2¼	2–2	8–8	5	160
	2–2	7–7	4	112*		2–2	8–7	5	150
	2–2	7–6	4	104*	2½	2–2	7–7	5	140
2¾	2–2	6–6	4	96*		2–2	7–6	5	130*
2¾	2–2	8–8	3	96		2–2	6–6	5	120*
	2–2	8–7	3	90		2–2	6–5	5	110*
	2–2	7–7	3	84	2¾	2–1	9–8	4	102
3	2–2	7–6	3	78		2–1	8–8	4	96
	2–2	6–6	3	72		2–1	8–7	4	90
	2–1	8–7	3	68		2–1	7–7	4	84
3¼	2–1	7–7	3	63*	3	2–1	7–6	4	78
						2–1	6–6	4	72
					3¼	2–1	6–5	4	66*
						2–1	5–5	4	60*
						2–1	6–5	3	50

* Denotes open packs.

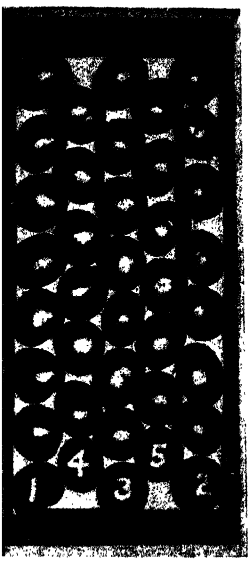
Nailing down is best carried out by placing two battens lengthways on the floor so that the ends of the case will rest on them, allowing the bottom to bulge slightly when the lid is nailed on (Fig. 4).

The chief points of the standard pack are as follows. Memorising these will assist the beginner a great deal:—

1. All fruit to be placed on edge, that is, on its cheek;
2. Use three packs: 3—2, 2—2, and 2—1 (Fig. 6).
3. Two fruits must not rest directly one on top of the other but in the pockets formed by the spaces between the fruit of the previous layer (Fig. 7).
4. The height of the fruit in the case is governed by the size of the pockets in each layer (Figs. 9 and 10).
5. Correctly packed fruit is always placed in straight lines from end to end, across and diagonally in the case (Fig. 8), the fruit always being in alignment.

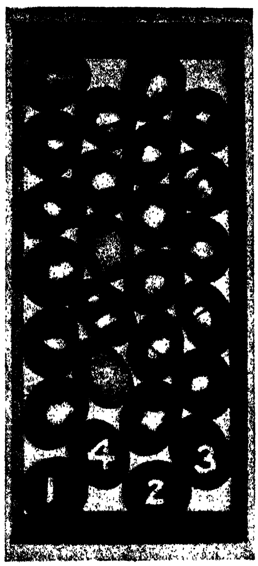
The illustrations show the method of carrying out the rules of packing, and also show the method of placing the fruit and arriving at the name of pack and layer count mentioned in the table of packing counts (see Fig. 5). Reference to the packing count table will give the beginner an idea of the pack to use for each size. Packing counts are given for the dump half case made both ways and for the long half-bushel case. A handy sizing gauge can be made by cutting holes 2 inches, 2¼ inches, 2½ inches, 2¾ inches, 3 inches, and 3¼ inches in diameter in a piece of plywood. A 2¼-inch fruit is one that will drop through a 2½-inch ring but not through a 2¼-inch ring; 2½-inch is fruit that will not go through a 2½-inch ring but will drop through a 2¾-inch ring. The same method of measuring applies to the other sizes. It is necessary to make a good start in packing the case correctly, and great care should be taken to see that a good snug, firm, first layer with all fruit in alignment is packed. By placing the correct sized fruit in the pockets of the first and each successive layer the packer will soon learn to pack correctly. By studying the illustrations of the start of the second layer packers will see how the

3—2 pack, 8 x 7 layer, 4 layers in the case, total 150. The layer count is obtained by counting from end to end two side by side lines of fruit in the case. (*See* Fig. 5.)



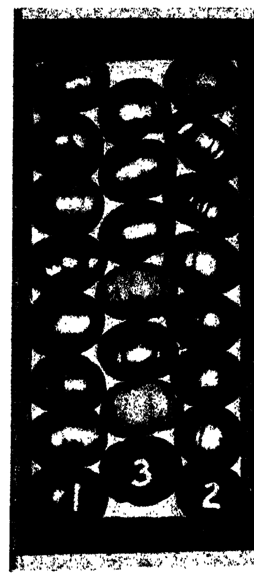
First layer 3—2 pack. The pack gets its name from the first layer being started with three placed against the end of the case and then two being placed in the pockets formed by the three. This is repeated until the layer is full.

2—2 pack, 7 x 6 layer, 3 layers in the case, total 78. The layer count is obtained by counting from end to end two side by side lines of fruit in the layer. (*See* Fig. 5.)



First layer 2—2 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then two being placed in the pockets formed by the two. This is repeated until the layer is full.

2—1 pack, 8 x 7 layer, 3 layers in the case, total 68. The layer count is obtained by counting from end to end the side by side lines of fruit in the layer. (*See* Fig. 5.)



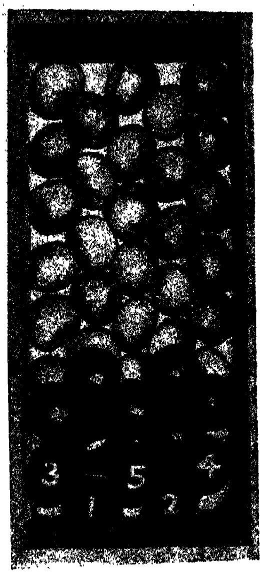
First layer 2—1 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then one being placed in the pocket so formed. This is repeated until the layer is full.

Plate 96 (Fig. 6).—First Layers of the 3—2, 2—2, and 2—1 Packs.
Note the order and position of placing each fruit.

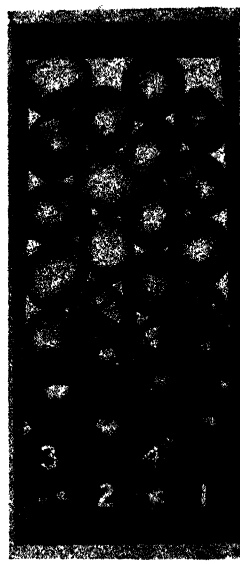
20

second layer fits in the pockets of the first layer. The third layer is the same as the first, being placed in the pockets of the second layer. It is advisable not to try to pack too fast when first learning. Pace is acquired with practice.

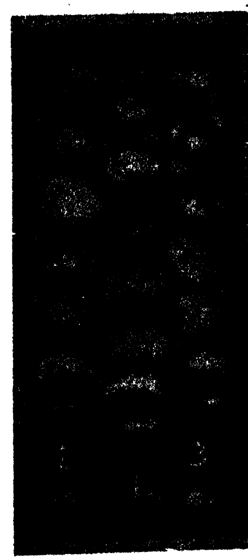
That the height of the fruit is governed by the size of the pockets in each layer is the most important rule in packing to remember. The counts marked with an asterisk (*) are the counts that are likely to give trouble. As an example, we will take the flat type 2½-inch tomato, 2—2 pack, 7—6 count, with 104 tomatoes. Most packers would try to pack this 2—2 with closed pockets 8—8 count with three layers containing 96 tomatoes, which would come low (Fig. 9), but by opening the pockets and getting a 2—2 pack, 7—6 count, and four layers containing 104 tomatoes (Fig. 10) the case is brought to the correct height without any trouble. The difference in the two cases is: Incorrect count 3 layers of 32, total 96; correct count, 4 layers each containing 26, or 8 more tomatoes to the case. This pocket system can be worked with all types of fruit, and the packer who masters it is soon expert in packing. Study the packing counts and see the packs that have to be packed with the open pockets, these being the only counts that may present difficulties to the beginner.



Second layer 3—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with three tomatoes.



Second layer 2—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with two tomatoes.



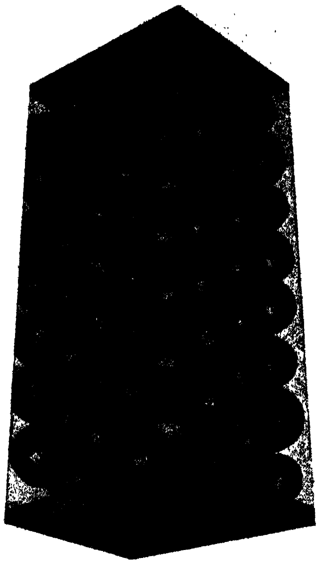
Second layer 2—1 pack. This layer starts with one tomato resting in the pocket of the first layer, which started with two tomatoes.

PLATE 97 (Fig. 7).—METHOD OF PLACING FRUIT IN SECOND LAYER.

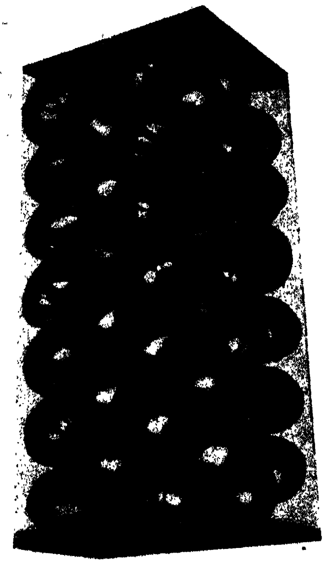
Note how the tomatoes rest in the pockets of the previous layer.

Noticing the correct alignment of fruit when packing is a guide to the packer, faults being easily detected by observing the pack getting out of alignment. When this occurs the packer should correct the fault immediately by removing the incorrectly sized fruit.

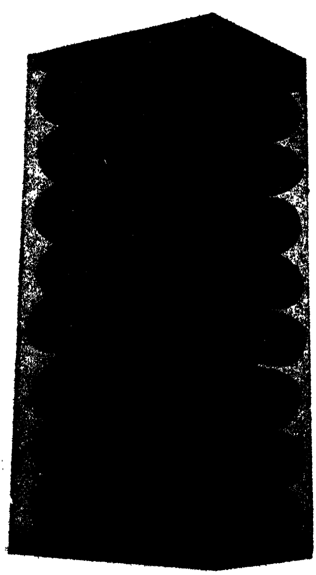
Mistakes must be corrected as they occur, because it is impossible to finish a case perfectly if any one layer is wrong. Packing a layer with fruit too small and placing in two extra is the most common fault found with beginners. When finishing off a case packed with open pockets many packers place two extra small tomatoes in the pockets at the end of the top layer, making it hard to get the lid on and spoiling the alignment of the whole case. A case only holds a certain quantity, and placing more in the case only causes bruising or splitting.



Finished case, 3—2 pack.

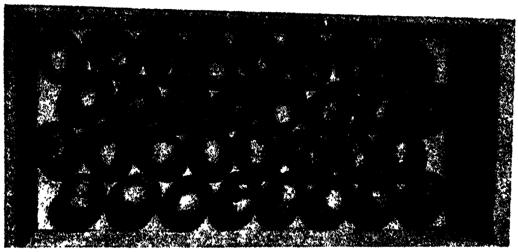


Finished case, 2—2 pack.

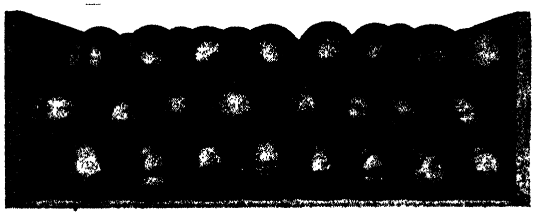


Finished case, 2—1 pack.

Plate 98 (Fig. 8).—Note Alignment of Fruit in the Case.



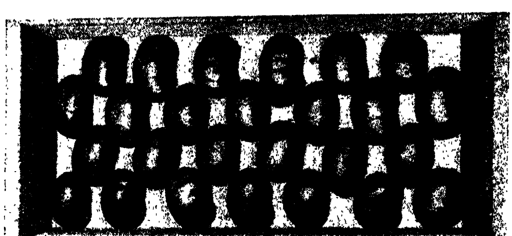
First layer.



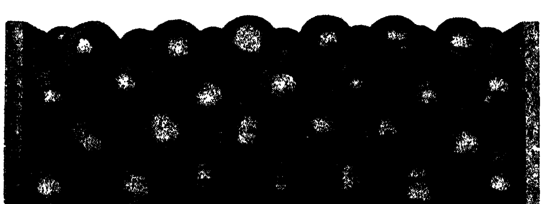
Finished case not high enough.

PLATE 99 (Fig. 9).

2½-inch tomatoes packed 2—2 with closed pockets, 8 x 8 count, 3 layers, 96 tomatoes, which is too low, but when packed with open pockets, as in Fig 10. comes to the correct height.



First layer.



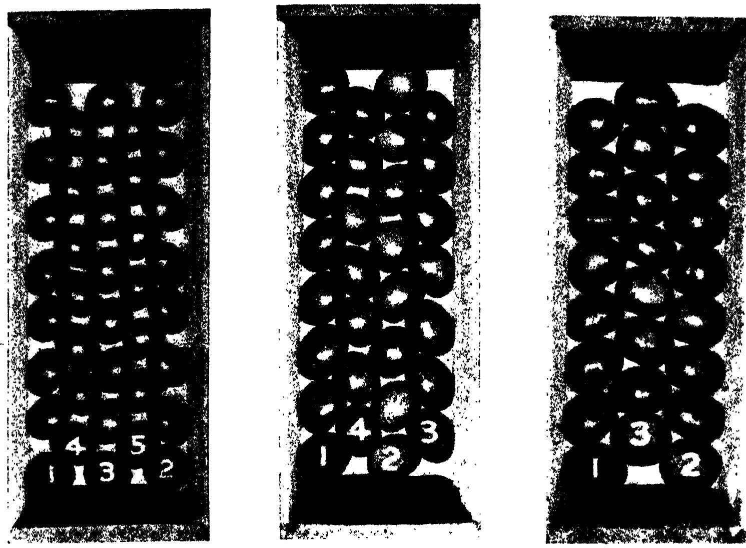
Finished case.

PLATE 100 (Fig. 10)—THE SAME FRUIT AS IN FIG. 9.

Packed 2—2, with open pockets, 7 x 6 count, 4 layers, 104 tomatoes, which comes to the correct height.

These illustrations explain the rule—"The size of the pocket governs the height of the fruit in the case."

FLAT TOMATOES.



3—2 pack. 8 x 7 count, 6 layers, total 225. | 2—2 pack. 8 x 7 count, 5 layers, total 150. | 2—1 pack. 8 x 8 count, 4 layers, total 96.

PLATE 101 (Fig 11).—FIRST LAYERS PACKED IN CASES MADE ON THE NARROW SYSTEM.

PLATE 102 (Fig. 12).—FINISHED PACKS IN CASES MADE ON THE NARROW SYSTEM —18 IN. LONG, $7\frac{1}{8}$ IN. WIDE, $8\frac{2}{3}$ IN. DEEP.

PACKING ROUND TYPE TOMATOES.

Round type tomatoes of the "Marglobe" variety pack best in cases made on the narrow system. The system of packing is the same. Packers should compare the approximate sizes of the round and flat types of fruit in order to show the difference in the number in each case; for example, fruit of the flat type of approximate size 2½ inches in diameter count 110 to 140, compared with the round type counts of 84 to 96.

PACKS THAT BRING ROUND-TYPE TOMATOES TO THE CORRECT HEIGHT IN THE CASE.

Round Type Tomatoes.—Counts to use when packing the Half-bushel Dump Case, 18½ in. long x 7⅛ in. wide x 8⅔ in. deep.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.	Type of Pack.
2 in.	2—2	8—8	5	160	
	2—2	8—7	5	150	
	2—2	7—7	5	140	
	2—2	7—6	5	130	
2¼ in.	2—2	6—6	5	120	Open pockets
	2—2	6—5	5	110	
	2—1	9—8	4	102	Closed pockets
2½ in.	2—1	8—8	4	96	
	2—1	8—7	4	90	
	2—1	7—7	4	84	
2¾ in.	2—1	7—6	4	78	Open pockets
	2—1	6—6	4	72	
3 in.	2—1	6—5	4	66	
	2—1	5—5	4	60	
4 in.	2—1	6—5	3	50	Closed pockets
	2—1	5—5	3	45	

PACKING THE LONG HALF-BUSHEL CASE, 26 INCHES LONG BY 6 INCHES WIDE BY 7⅛ INCHES DEEP.

This case is not recommended before the half-bushel dump case. The same system of packing is used, the diagonal packs and counts being slightly different to the half-bushel dump case owing to the different dimensions. This case is composed of two compartments 13 inches long by 6 inches wide by 7⅛ inches deep. The packing counts given are for each compartment.

PACKING COUNTS TO USE WHEN PACKING FLAT-TYPE TOMATOES.

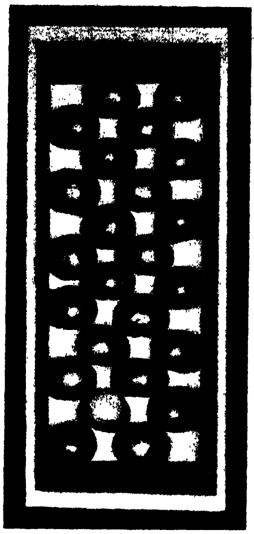
Long half-bushel case, 26 inches long by 6 inches wide by 7⅛ inches deep.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.	—
2 in.	2—2	6 x 6	5	240	
	2—2	6 x 5	5	220	
	2—2	5 x 5	5	200	Open pack
	2—1	8 x 8	4	192	
2⅛ in.	2—1	8 x 7	4	180	
2¼ in.	2—1	7 x 7	4	168	
	2—1	7 x 6	4	156	
2½ in.	2—1	6 x 6	4	144	
2⅝ in.	2—1	6 x 5	4	132	
2¾ in.	2—1	5 x 5	4	120	Open pack
	2—1	5 x 4	4	108	
3 in.	2—1	5 x 5	3	90	
	2—1	5 x 4	3	82	

Round Type Tomatoes.

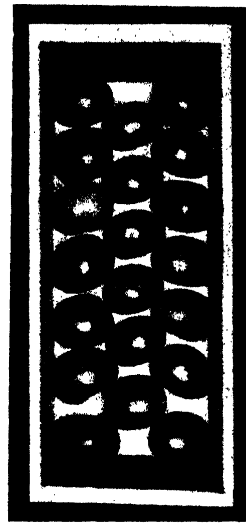
It is preferable to pack tomatoes of this type in cases made on the narrow system.

2—2 Pack.



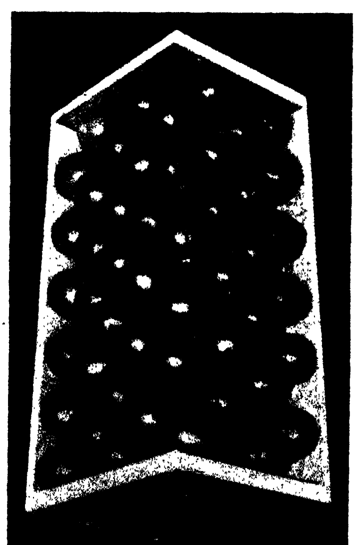
6—6 Layer, 5 Layers, Total 120.

2—1 Pack.



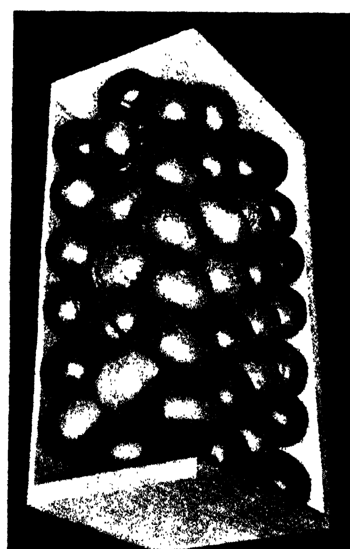
7—6 Layer, 4 Layers, Total 78.

Finished Case. 2—2 Pack.
Side. Top.



6—6 Layer, 5 Layers, 120 Count.

Finished Case. 2—1 Pack.
Top. Side.



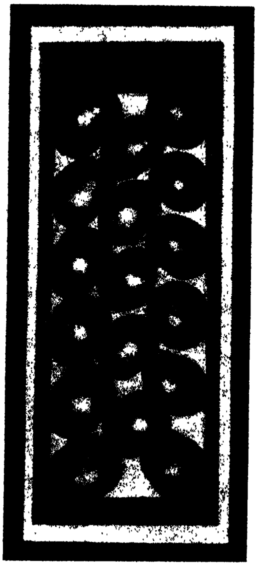
7—6 Layer, 4 Layers, 78 Count.

Note the alignment of the fruit in the case.

Plate 103.

2—1 PACK, 3 LAYERS.

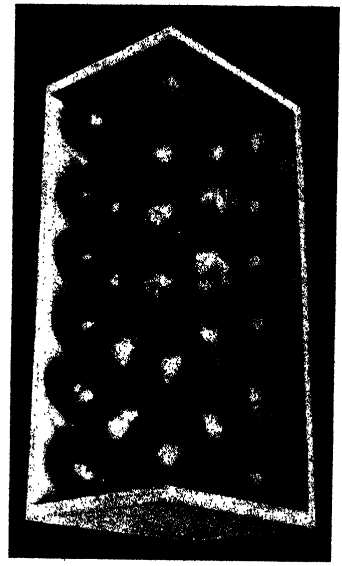
First Layer.



2—1 Pack, 6—5 Layer, 3 Layers, 50 Count.

Finished Case.

Top. Side.



2—1 Pack, 6—5 Layer, 3 Layers, Total 50. Compare this 3 Layer 2—1 Pack with the 4 Layer 2—1 Pack.

Finished cases of round-type tomatoes packed in the case made on the narrow system 18 inches long by 7¼ inches wide by 8¾ inches deep.

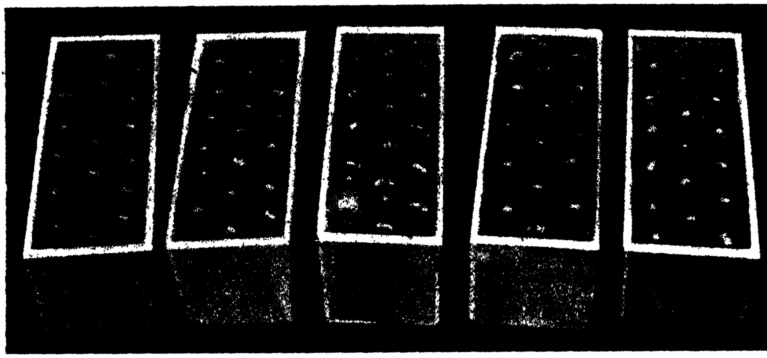
2—2 PACKS. 2—1 PACKS.

120 Count. 110 Count. 102 Count. 96 Count. 90 Count. 84 Count.

PLATE 104.

2—1 PACKS. 4 LAYERS. | 2—1 PACK. 3 LAYERS.

7—6 Layer. 6—6 Layer. 6—5 Layer. 5—5 Layer. 6—5 Layer.



78 Count. 72 Count. 66 Count. 60 Count. 50 Count.

PLATE 105.

NOTE.—Compare cases 66 count with 50 count. Both of these cases are packed 2—1 and have a 6—5 layer, the difference being that the 66 count contains four layers and 50 count three layers.

PACKING COUNTS TO USE WHEN PACKING ROUND-TYPE TOMATOES.

Long half-bushel case, 26 inches long by 6 inches wide by 7¼ inches deep.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.	—
2 in.	2—1	7—7	4	168	Closed packets
	2—1	7—6	4	156	
2¼ in.	2—1	6—6	4	144	
	2—1	6—5	4	132	
	2—1	5—5	4	120	Open pockets
	2—1	5—4	4	108	
2½ in.	2—1	4—4	4	96	
	2—1	5—5	3	90	Closed pockets
2¾ in.	2—1	5—4	3	82	
	2—1	4—4	3	72	Open pockets
3 in.	2—1	4—3	3	64	
3½ in.	2—1	3—3	3	54	Pack with the blossom end of the fruit to the side of the case
	2—1	3—2	3	46	

It will always be wise to remember the following points in marketing:—

Good packing alone will not keep up a demand for bad fruit. Good fruit is always necessary, and good fruit well packed and attractively got up is easy to sell and will, in times of over-supply, be the first to be disposed of.

For special grade tomatoes wrapping is recommended when long distances have to be traversed. When fruit is wrapped the use of lining paper is not necessary. When unwrapped it improves the appearance of the finished case to use plain or coloured paper for lining in preference to the use of newspaper, which looks shoddy and shabby, favoured by some of the growers. A coloured label also adds distinction to the packed case, and is recommended. Good packing and get-up

followed by careful handling and loading whilst in transit to the market will give the grower the best returns for his labour. Using a packed case as a seat while carting is a very common fault with growers and carters, as is also the walking on cases while stacking in trucks. Want of thought is the reason as a rule why fruit is badly handled in these ways.

Acknowledgment.

Thanks are due to Mr. P. Bach, Pinklands, Mr. A. F. Smith, and Mr. W. Burns, Thornlands, and Arkell and Sons, Fruit Exchange, Brisbane, for making available fruit for illustrations.

Main Points to Remember.

In conclusion, the following are the main points for packers and others who handle fruit to remember:—

Don't place green and ripe fruit in the one case.

Don't place one fruit directly on top of another when packing, but keep them in the pockets of the preceding layer.

Don't stand, walk, or sit upon packed cases.

Don't pack immature green tomatoes; they will not ripen properly.

Don't pack defaced, marked, or damaged tomatoes; they reduce the value of the case.

Don't use newspaper for lining; plain paper pays.

Don't try and pack large and small tomatoes in the one case; it spoils the alignment and the appearance of the pack and helps to reduce the price of the case.

PLATE 106.—WESSEX SADDLEBACK SOW.

HOLMSLEIGH ACE (Imp.), property of R. Turpin, Kentville. Winner of First Prize, Brisbane Show, 1931 and 1932, and a representative of a breed that caught the public eye at the Brisbane Exhibition.

"Queenslander" Photo.

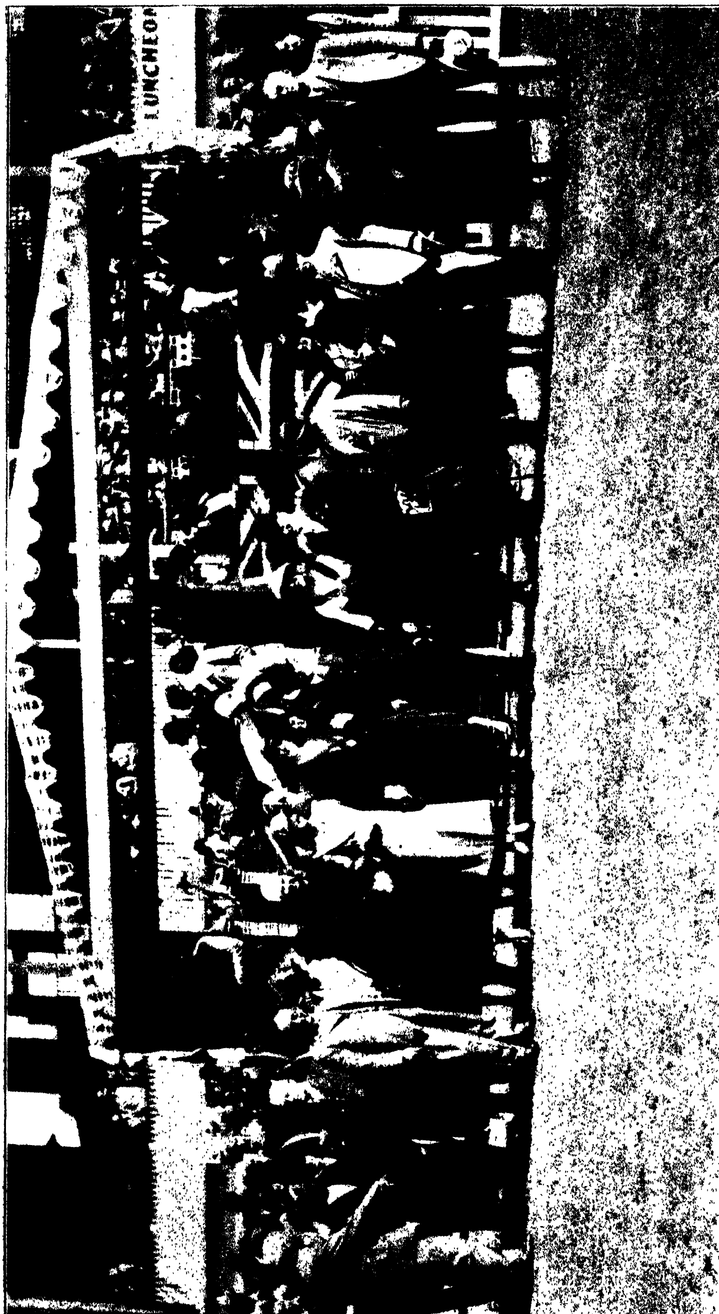


PLATE 107.—ON THE OPENING DAY OF THE BRISBANE SHOW.

The group includes their Excellencies the Governor-General, Sir Isaac and Lady Isaacs, their Excellencies Sir Leslie and Lady Wilson, and the Premier, Hon. W. Forgan Smith, and Mrs. Forgan Smith.

PLATE 108.—ARRIVAL OF HIS EXCELLENCY THE GOVERNOR, SIR LESLIE WILSON, AT THE BRISBANE SHOW.

Plate 109.—Boonah Light Horsemen receive their Trophy from His Excellency the Governor-General, Sir Isaac Isaacs, at the Brisbane Show.

PLATE 110.—ON THE LAWN AT THE BRISBANE SHOW.

The group includes Her Excellency Lady Isaacs and the Premier, Hon. W. Forgan Smith.

PLATE 111.—"THE GRASS THAT HAS CONQUERED MAN. THE GRAIN THAT IS BREAD."
This display of Queensland wheats was one of the finest features of the Departmental Court at the Brisbane Show.

PLATE 112.—THE WEALTH OF QUEENSLAND'S ORCHARD LANDS ILLUSTRATED AT THE BRISBANE SHOW.

PLATE 113.—QUEENSLAND GROWN TOBACCO AT THE BRISBANE SHOW.

In 1930-31 there were 382 acres under tobacco in this State, yielding 260,670 lb. of cured leaf. This year's production is approximately 2,750,000 lb. of cured leaf from 4,800 acres. This comprehensive display of leaf from Queensland's wide tobacco lands was definite proof that the State can supply a high quality product acceptable to both manufacturer and smoker.

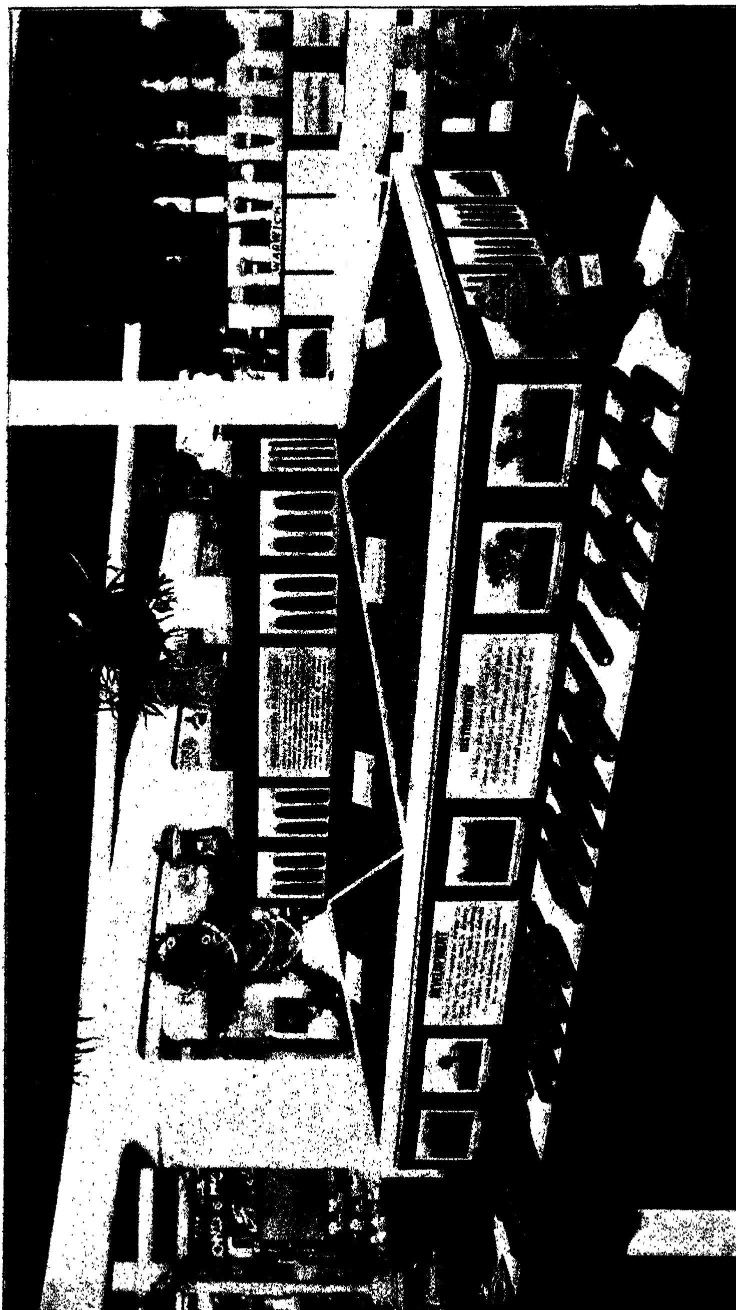


PLATE 114.—PRODUCTS OF QUEENSLAND'S GREAT GRAIN LANDS.

This fine display at the Brisbane Show told an impressive story of the development of maize breeding and production in Queensland. It also demonstrated the success of Departmental plant breeders in the evolution and fixation of types that have quadrupled our grain yield. Maize growing is now one of Queensland's major agricultural industries.

PLATE 115.—OUR WEALTH IN WOOL FITLY ILLUSTRATED AT THE BRISBANE SHOW.
Exhibit arranged by Mr. W. G. Brown, formerly Instructor in Sheep and Wool, Department of Agriculture and Stock.

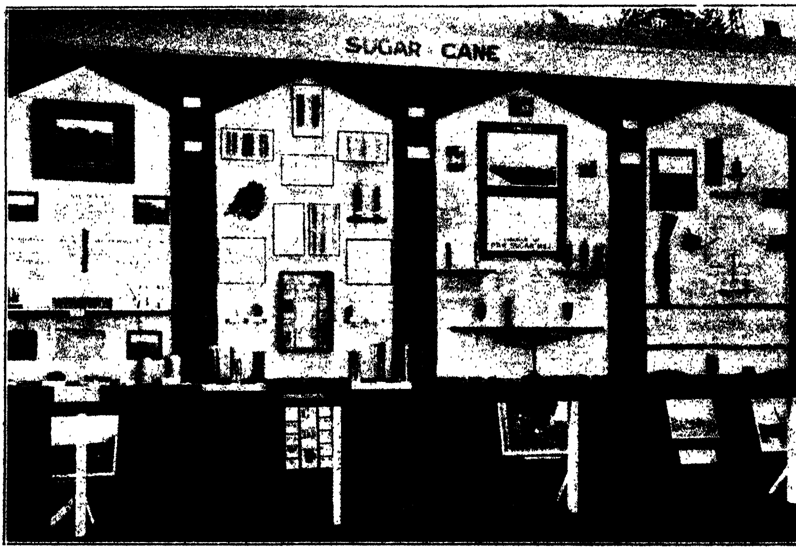


PLATE 116.—A WHITE MAN'S INDUSTRY IN A WHITE MAN'S LAND.

The cane alcove in the Court of the Department of Agriculture and Stock was an attractive and effective representation at the Brisbane Show of an industry carried on successfully by white Australian farmers and workers in field and factory, and which is worth approximately £10,000,000 a year to the Commonwealth.

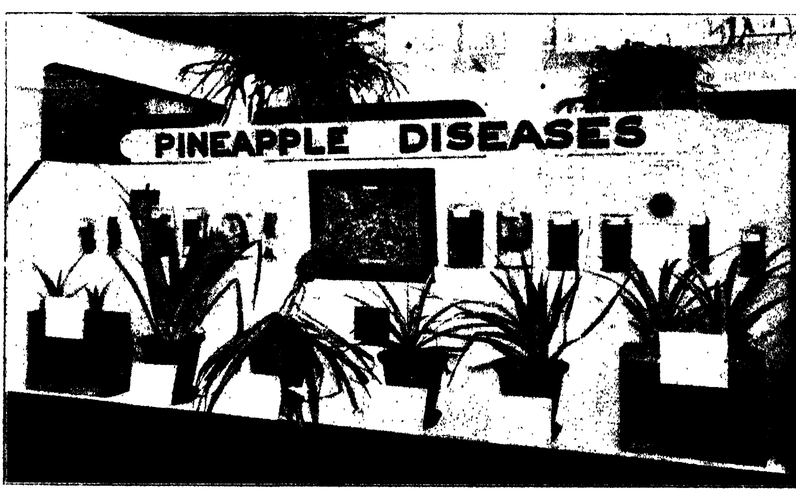


PLATE 117.—SCIENCE IN RURAL INDUSTRY.

This exhibit was one of several striking illustrations at the Brisbane Show of the extent and value of the scientific services available to farmers through the Department of Agriculture and Stock.

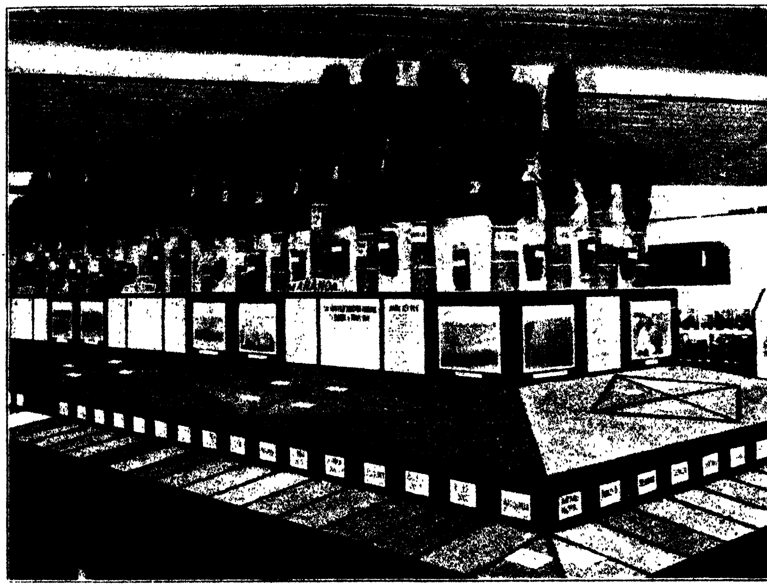


PLATE 118.—THE CENTRAL TROPHY IN THE AGRICULTURAL COURT.
A story of Departmental effort and success told in sheaf, grain, and valuable derivatives at the Brisbane Show.

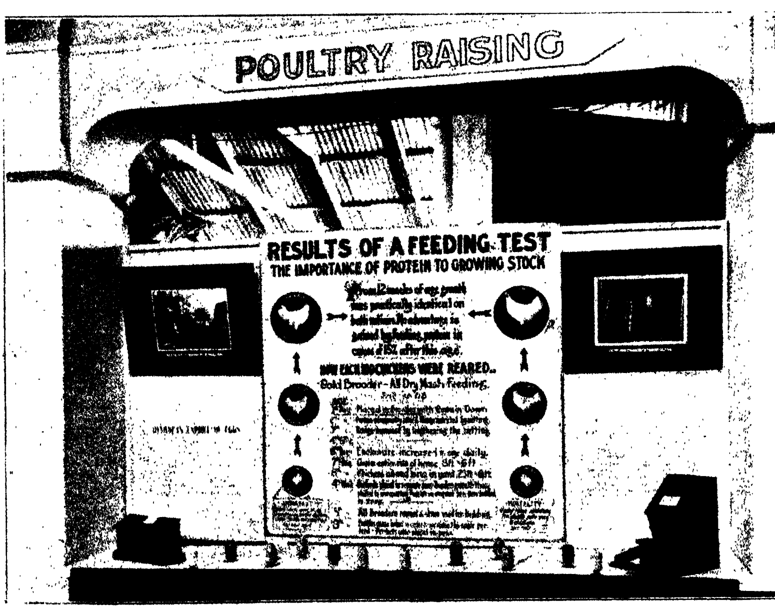


PLATE 119.—POULTRY PANEL IN THE COURT OF AGRICULTURE AT THE BRISBANE SHOW.

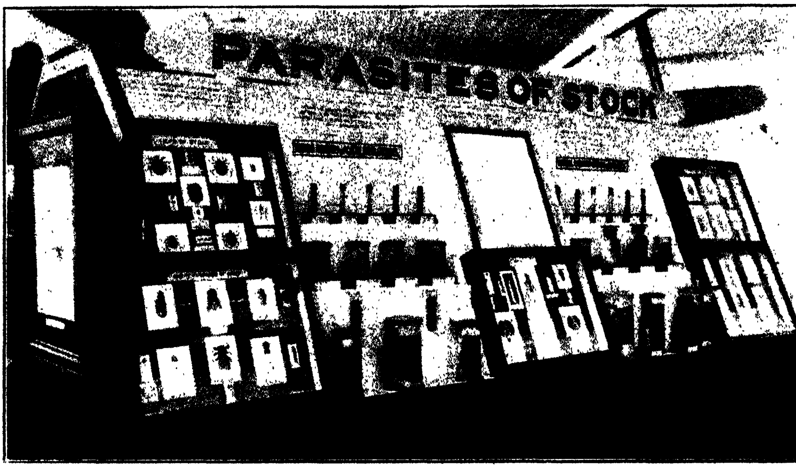


PLATE 120.—EXHIBIT FROM THE STATE ANIMAL HEALTH STATION.

PLATE 121.

THIS PANEL IN THE AGRICULTURAL COURT ILLUSTRATED THE VALUE OF THE SCIENTISTS' SERVICE TO THE FARMER.

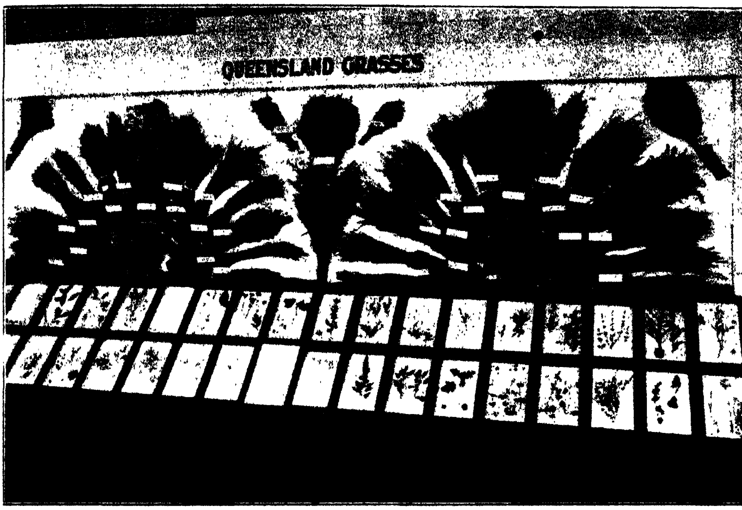


PLATE 122.—"ALL FLESH IS GRASS."

These samples of Queensland's pastures panelled in the Agricultural Court at the Brisbane Show illustrated a wide range of nutritious indigenous grasses and herbs from which is derived a vast proportion of our natural wealth.

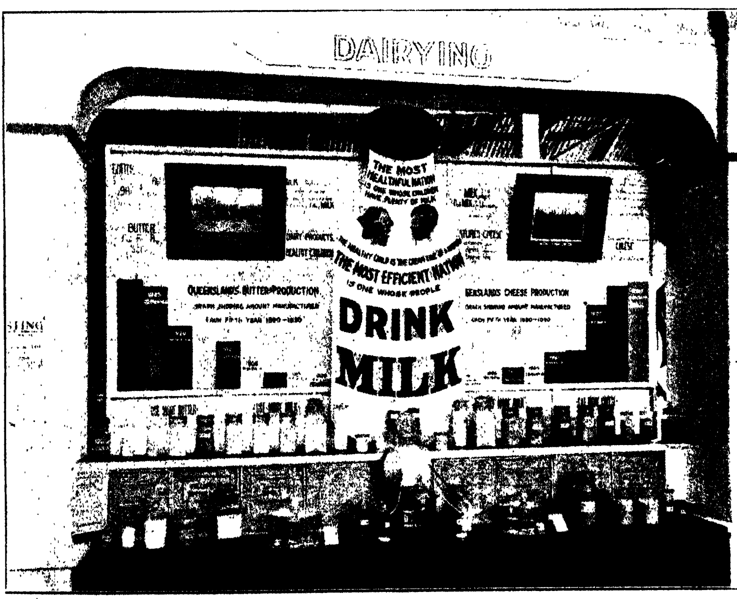


PLATE 123.—MILK FOR THE MULTITUDE.

Dairying in Queensland has developed into an industry of first importance. One-fourth of the aggregate butter output of the Commonwealth, and almost half the cheese out-turn are produced from Queensland pastures. The annual value of the industry is approximately £7,000,000.

PLATE 124.—THE JOURNAL AT THE SHOW.

The "Q.A.J." Information Bureau, established in the Agricultural Court at Brisbane Show, was the distributing centre of useful information on Departmental activities. Mr. Eric Keehn is the young officer in charge.

PLATE 125.—THE PIG PANEL IN THE AGRICULTURAL COURT.

Pig raising is a well-established Queensland industry. Throughout the year an active educational campaign is carried on by the Department of Agriculture and Stock, and this exhibit illustrated the effectiveness of that work.

THE MAIZE INDUSTRY IN QUEENSLAND.

By C. J. McKEON, Instructor in Agriculture.*

Mr. McKeon has for many years been associated with plant breeding in Queensland, and especially with the improvement of maize varieties, as directed by the Department of Agriculture and Stock.

At this year's Royal National Exhibition at Brisbane many excellent examples of the results obtained through this important work were displayed and attracted much attention from growers and seedsmen. Mr. McKeon's observations are a welcome contribution to current literature on the subject.—Ed.

MAIZE is the world's most extensively grown cereal, the average annual yield for the five years ending 1913 being 4,119,000,000 bushels, whilst the average production for a similar period ending 1929 was 4,445,540,000 bushels, a very considerable increase. Approximately 75 per cent. of this quantity was produced in the United States of America.

By way of comparison, the world's average annual production of wheat is 4,319,659,000 bushels. Irrespective of the position as exists in Australia from these figures it is quite apparent that, from the world's standpoint, the diminishing demand for horse feed, brought about by the use of motor power and transport, has not had the effect of decreasing the production of maize, in fact the figures previously quoted show an increase, which goes to prove that new uses have been found for the grain.

Food Value of Maize.

The value of maize for feeding to stock on the farm, also as a human food, is appreciated more in America probably than in any other country. Out of the enormous annual yield of approximately 3,000,000,000 bushels in the United States about 85 per cent. is fed to stock, 10 per cent. is used for human consumption, and only about 1½ per cent. is exported.

The average yield per acre in Australia compares very favourably with that of the other chief maize-producing countries. Taken over a five-year period, 1926-1930, this was slightly over 26 bushels compared with 27 bushels in America, and an average yield per acre for the whole world of, approximately, 23 bushels.

The maximum area under maize in Australia was during the 1910-1911 season, when 414,914 acres were sown and a record crop of over 13,000,000 bushels resulted. These figures were approached during the 1924-25 season when the Commonwealth yield was just under 12,500,000 bushels, due mainly to a record yield in Queensland of 7,733,000 bushels.

In the past one of the principal uses for maize was as horse feed. Owing, however, to the increased use of motor power generally throughout the Commonwealth, and the corresponding decrease in horse power, the demand for maize for horse feed is becoming smaller each year, and it is essential in the interests of the industry that other economic methods of utilisation should be found.

Queensland's Chief Cereal.

Maize is Queensland's chief cereal, over 50 per cent. of the total crop for the Commonwealth being produced in this State. The crop is worth approximately £1,000,000 a year to the State; that for the 1924-25 season was worth nearly one and a-half millions. As maize in Queensland is usually grown in comparatively small areas, the resultant high cost of production is the principal factor against depending upon an export trade, while the distance from the overseas markets is also a big handicap. Before attempting to build up an export trade, our own Australian markets could be greatly developed. Much could be done to further popularise maize as a stock food, and if the same percentage of Australia's crop were used for this purpose, as is being done in America, maize-growers would have little to fear regarding overproduction. As an illustration of what effect this would have, and using the record Commonwealth yield of 13,000,000 bushels as an

* In a series of radio lectures from 4QG.

example, 85 per cent. of which would mean 11,000,000 bushels, if this quantity or anything approaching it were used for stock food the balance would be quite inadequate to meet Australia's requirements and would necessitate increased production. Its value as a human food is being appreciated more each year, this being proved by the greatly increasing demand for maize for this purpose, the annual requirements of some secondary enterprises now being in excess of 1,000,000 bushels.

The average number of dairy cows in Queensland is 666,500, and the number of pigs averages about 209,000. Allowing that each animal consumed only 3 bushels in the course of the year, equal to under 2 lb. weight a day for less than three months of the year, it would mean an annual consumption of 2,626,500 bushels, equal to 52 per cent. of the State's average crop of 5,042,600 bushels. The value of maize meal as a food for dairy cattle in the colder months of the year when natural supplies of food are either scarce or possess little food value, is not by any means fully appreciated by dairymen in this State. Those, however, who have tried it soon became convinced of its value.

Apart from its high food value, being a carbohydrate, it helps to maintain warmth in the body, which is of great assistance to cows in cold districts in keeping up the milk supply. Butter prices are almost invariably higher during the winter months and the increase in production readily pays for the maize used and for the little extra time occupied in feeding.

A Popular Ration for Pigs.

Maize has long been a popular pig food and its value for this purpose was fully demonstrated in the feeding trials conducted recently at Yeerongpilly to demonstrate the comparative feeding values of maize, wheat, and barley when used in balanced rations.

It was stated in the report that the maize-fed pigs grew faster and required less food by weight to produce a given quaitity of pork than those fed on wheat and barley. In fact, they did so well that when marketed along with the wheat and barley-fed pigs they were slightly past prime condition. The quality of the bacon was equally as good as that from the pigs fed on the other grains and was very favourably commented on by the grader and curer at the bacon factory. Results equally as good were obtained in a poultry-feeding experiment at Mount Gravatt recently. In a ration where maize exceeded 50 per cent. Australorp cockerels were produced which weighed at eighteen weeks of age more than 5¼ lb. At twenty-four weeks the average weight of all males in the test was approximately 7 lb.

Range of Cultivation.

Vast areas in Queensland are suitable for maize-growing and were the industry to warrant it, considerable expansion could take place. It is grown extensively along the coastal area from the Tweed to Rockhampton and inland within the 30-inch rainfall belt.

The Moreton, Wide Bay and Burnett, and Darling Downs districts among them usually produce over 80 per cent. of the State's crop, the next district of importance being the Atherton Tableland which, due to the comparatively safe rainfall, has much the highest yield per acre of any district.

With the exception of districts such as the Atherton Tableland, where the reliable rainfall practically assures a crop, in fact loss is more often occasioned through excessive rain than from drought, maize-growing is chiefly carried out in conjunction with some other form of farming. Where it is depended upon as a sole means of livelihood large areas are necessary to show a payable return, for when prices are taken over a number of years it will be found that the margin of profit is small. It can be grown more profitably in conjunction with other forms of farming, particularly dairying and pig raising, two industries which are associated almost invariably. When grown in this way it is very rarely a dead loss, except of course in exceptional circumstances such as floods and other disastrous visitations. Should the crop become a failure through dry weather setting in during the tasselling period, it can be used either as a green fodder for dairy stock or for converting into silage.

Frequently maize will make excellent growth up to the tasselling stage, but may not produce a payable crop owing to hot dry winds prevailing at this period. For converting into silage it is one of the most suitable and widely used crops.

Growers' Organisation.

Several attempts have been made in recent years to organise the maize growers throughout the State, but on each occasion the requisite number of growers did not vote in favour of a pool. Growers as a whole would certainly benefit by some form of organised marketing as they would then be able to enter into contracts which would not be possible under present conditions. As a result of organised marketing the Atherton Maize Board was able to enter into a five-year contract with a Melbourne firm to supply 240,000 bushels annually at 4s. per bushel f.o.b. Cairns. Another Southern manufacturer requires large quantities of maize of one special type, but growers could only enter into a contract such as this when efficiently and adequately organised, for production as well as for marketing. It might also be possible to enter into some arrangement with graziers to supply them with maize at a price which would be satisfactory to both grower and purchaser for storage on stations as a standby for stock food, in times of drought. Sheep owners in the past have had to purchase huge quantities for this purpose at a high price, and as the difference between the price of maize during drought periods and that at which it can be purchased during normal seasons is considerable and would more than pay for the cost of storage something could certainly be done in this direction to the advantage of both farmer and grazier.

THE SELECTION OF SEED MAIZE.

THE importance of careful seed selection cannot be too strongly stressed and maize-growers who practice this are more than compensated for the little extra work which it entails.

It is becoming more evident each year that a large number of Queensland maize-growers appreciate this fact, and that they either carefully select their seed requirements from their own crops, or obtain them from some reliable source. This is borne out by the number and excellence of exhibits displayed at Brisbane and country shows.

Growers who have not a pure strain of a high-yielding variety known to be suited to their particular locality and who are desirous of having them, should be sure that they are getting their seed from a reliable source, otherwise the resultant crops will probably prove to them that the crop from which the seed was selected was grown in close proximity to a different, and probably mixed variety, and that cross fertilization has occurred.

As maize cross-fertilizes very readily, the pollen being borne for a considerable distance by wind and insects, difficulty is frequently experienced in closely settled districts in keeping maize varieties pure.

Cross fertilization can only occur when both crops tassel at the same time and a difference of a few weeks between the plantings is sufficient to prevent this. As this, however, is not always possible owing to advantage having to be taken of suitable rains, in the event of a neighbouring crop tasselling at the same time, the selection should be confined to that portion of the crop which is furthest from the other crop and if possible away from the direction from which the prevailing winds blow.

Selection should be carried out in the field and should be done before the plants are thoroughly dry, so as to be able to distinguish between the early and late maturing plants.

By continually selecting as nearly as possible only ears of even ripeness, the crop will tassel evenly and better fertilization, and consequently well filled ears, will result.

Late maturing plants will naturally tassel later than the balance of the crop and the supply of pollen is then limited; the plants frequently having to depend entirely on their own supply of pollen, and the ears are frequently very poorly filled. In selecting for early maturity, care must be taken to see that the plants have ripened naturally and that ripening has not been hastened by disease or any injury. A common cause of forced ripening is the maize grub, and it will frequently be found on examination, that the grub has bored into the shank and caused the ear to ripen prematurely.

Selections should be made only from strong healthy plants with a good root system and from those which are growing in an average stand and not in an isolated or favoured position. A good root system is very important, for a plant with a

poorly developed root system cannot withstand drought; it is more easily blown down by the wind, and there is also the possibility of the poor development being due to disease.

The height of the ears on the plant is another very important point to be considered. They should be borne at, or slightly below the middle of the plant, for where they are borne high up on the stalk, harvesting is rendered more difficult and the plants will lodge much more readily during wind storms.

Ears with a shank of medium length and thickness which turn down during ripening should be selected in preference to those with a short, thick shank which remains erect. An ear when turned down will shed water more readily and is also less liable to become damaged by birds and insects than those which remain in an upright position, providing of course the husk covering extends well over the tip of the ear.

A good husk covering is very necessary, for it will almost invariably be found that an ear which has the tip protruding is more or less damaged by water or insect attack.

Regarding the number of ears to the plant, it is advisable to select from the plants which bear one good ear and at the most two, providing one of them is of standard size. Otherwise it will be found that the tendency will be to produce several small ears, with the result that the quality of the grain is affected and the cost of harvesting is increased. The points already discussed will show how necessary it is to carry out the seed selection in the field, if a grower wishes to improve the variety and at the same time retain the desirable characteristics which the variety possesses.

Where this is not practised and the selection work is left until the crop has been picked it will be impossible to tell under what conditions the ears were produced, and many which are produced under most favourable conditions will be selected in preference to others which are only slightly smaller, but which were produced under average or probably adverse conditions. Naturally, those produced under average or adverse conditions would be of much greater value for seed purposes than those produced under favoured conditions.

It is advisable to always select considerably more ears in the field than will actually by required for seed purposes. The final selection should be made in the barn and the ears selected should be of good size, without being coarse, and should also be of uniform type, shape, and colour. They should be cylindrical in shape, except in the case of a few varieties which produce a slightly tapering ear, and should be well filled up to the tip.

The types of dents vary, a few varieties having a "smooth" or "dimple" dent, but the majority of the most popular varieties now grown in this State have a "crease" to a "medium rough" dent. Grain with a "pinch" dent should be avoided, and, although it is usually of good depth, it is almost invariably light and of a soft starchy nature and will never command the price that plump, well-filled maize will. The shape of the grain varies according to the variety; those which produce ears with less than fourteen rows, such as Golden Beauty and Hawkesbury Champion or Golden King, have a slightly round shouldered, broad grain of medium depth. Those which produce ears with fourteen rows and upwards should have square shouldered, tightly packed grain with only a very small space between the rows. The grain should be firmly attached and should show little or no movement when pressed with the points of the fingers. Ears with coarse, sappy piths or cores should not be selected, as they dry out slowly and generally show a lower shelling percentage than those with a medium-sized core.

Uniformity in breadth and shape of grain is a very important point, and is one which should be strictly adhered to if the variety type is to be preserved.

The colour of grain differs according to variety. Some of the yellow varieties having a bright amber-coloured grain with a rich yellow cap, and others a pale, amber-coloured grain with a light cream-coloured cap.

Whatever colour is being selected, uniformity should be practised and on no account should an ear of a yellow variety, for instance, be selected which shows reddish or white grains. The straightness and evenness of the rows, while being desirable features, are less important than those already discussed, and as long as they are reasonably straight and even and the ears are otherwise desirable they need not be discarded.

The ears should be topped and tailed before shelling, not that the round grains from the tips and butts would not germinate, but because it is impossible to get an even sowing with a planter with seed that lacks uniformity in shape and size.

Before the seed is stored it should be thoroughly dry and quite free from injurious insects.

The quantity of seed maize required for the average farm is not large, and it is quite a simple matter to store the grain and keep it in good condition for the following season's planting. All that is necessary is an air-tight container, such as a carbide drum, and, after making certain that the grain is thoroughly dry, it can be placed in this with a small quantity of flaked napthalene mixed well through it and the lid sealed down. The napthalene will destroy any moth or insects which may hatch after the grain is placed in the container, and will not affect the germination.

MAIZE VARIETIES AND THEIR SUITABILITY FOR DIFFERENT DISTRICTS.

ALTHOUGH this species has been classified into several different sub-species, it is intended to deal only with those which are grown on a commercial scale in Queensland.

Dent Maize.

As far as Queensland is concerned the Dent varieties, which include Yellow, White, and Red are of much the greatest importance. Quite a number of growers, however, do not appear to be aware that there are very many different varieties and strains of Dents, particularly Yellow Dents, grown in different parts of the world and, as a matter of fact, the bulk of the maize grown in Southern Queensland is a Dent of some variety.

The grain of these varieties has a characteristic dent in the crown when mature, this being due to the shrinkage of the soft starch when drying. The soft starch extends from the germ to the top of the grain and lies between two sections of horny endosperm on either side.

Flint Maize.

This, as the name implies, is a hard type of maize and contains a much higher percentage of horny endosperm than the Dent varieties. The soft starch does not, as in the case of the Dents, extend to the top of the grain, but is entirely surrounded by the horny endosperm.

The grains carry only a very slight, and in many cases no indentation whatever. In Southern Queensland, where the high yielding Dent varieties can be grown so successfully, the Flint varieties are not commonly grown. They are more suitable for districts which experience a heavy rainfall, particularly during that period of the year when the crop is ripening. Under conditions such as these, the Flint types have proved to be much more resistant to Diplodia, and other fungus diseases, and give much more satisfactory results than the softer and more starchy Dent varieties.

Flour Maize.

This is a very soft, floury type of maize and contains no horny starch whatever. The grains like those of the Flint varieties are somewhat rounded and show only a very slight indentation.

Maize of this class is not grown to any extent in Queensland for commercial purposes, its softness rendering it very subject to weevil attack and, in addition, it is not a heavy cropper. It, however, makes an excellent meal for stock feeding purposes and a limited area is sown with the Brazilian white variety each season for this purpose.

Those already mentioned, i.e., Dent maize, Flint maize, and Flour maize are almost entirely the only kinds now grown in Queensland, and, although Sweet Corn and Pop Corn have been grown, and very successfully too, there is not sufficient demand for either of these to warrant their production. Both are largely grown in the United States of America, Sweet Corn for culinary purposes and Pop Corn for confectionery purposes.

Practically every variety of maize shows a great variability in type, due to the fact that, unlike wheat which is naturally self-fertilized, it is not naturally self-fertilized and anyone who has been in a field of maize during the tasselling period and has seen the cloud of pollen which is carried throughout the field by wind can readily understand the amount of cross-fertilization which takes place. The constant crossing of the different genetic types causes this variability and consequently the same uniformity of type is not found, even in varieties which have been kept absolutely pure and have been carefully selected for very many years, as is found in other grains which are self-fertilized.

Environment also has an effect on type. Quite frequently the type of a particular variety is also changed through a grower having a fancy for a certain type and selecting closely to this type each season.

From what has already been said, it will be seen that even the best and most carefully selected varieties will show at least some variation in type, and in giving a description of any variety the type which occurs with the greatest frequency is that which is used as a standard.

It will also be readily seen how quickly any variety could become mongrelised, particularly in closely settled districts, through being grown in close proximity to another variety. This unfortunately is occurring frequently, and large areas are being sown annually with maize which bears little or no resemblance to the variety by which it is called.

This point was stressed in a previous talk, but it is of such importance that it is considered worth stressing again and growers cannot be too strongly advised to secure their seed, whenever possible, from some reliable source.

As maize is grown over such a wide area of the State, there is naturally a very large number of varieties and so-called varieties in use. The poor yielding and otherwise unsuitable varieties are, fortunately, fast disappearing, and one only has to see the excellent quality and trueness to variety type of the grain exhibited at the different agricultural shows to realise that most growers are now going in for not only the better varieties, but also for those varieties which are the most suitable for their particular district. For a number of years the Department of Agriculture and Stock has been carrying out seed maize improvement work on a large scale, and during that period a large number of different varieties have been tried. Only the best of these have been retained and as a result of the work of Departmental officers a considerable improvement in both type and yield has been effected in these varieties.

The popularity of these strains is evidenced by the large number of applications which are received for seed each year, and, although sufficient selected seed to sow some thousands of acres is distributed annually by the Department, the supply is never equal to the demand. The demand for seed was greater than ever this season, and the supplies of all varieties are now exhausted.

The varieties which will now be briefly described are those which are recommended by the Department:—

Funk's 90 Day.

This variety was introduced from America by the Department some years ago, and is now extremely popular with growers. It is an early maturing, fairly short growing variety and for a quick-maturing variety is a very heavy yielder. The ears are of fair size and carry usually from sixteen to twenty rows of very closely packed grain. The grain is plump, of good depth, and slightly pointed, with an amber-coloured base and a rich yellow cap and crease to a slightly rough dent. This variety is highly recommended for early crops, or for districts which have a short growing season. Yields of up to 100 bushels an acre have been obtained under field conditions from Departmental propagation plots.

Star Leaming.

This is a medium early variety and takes approximately four months to mature. It is without a doubt one of the best all round varieties grown in Queensland. For a fairly quick-maturing variety the ears are large, slightly tapered, and carry from sixteen to twenty rows of very closely packed grain. They are particularly

well covered, are borne low on the stem and turn down during ripening. The grain is slightly larger than that of the 90 Day, and is also of a brighter amber colour. It is a very suitable variety for early, or catch crops, and has proved to be suitable for any district, particularly the more inland regions which have not a heavy rainfall. Yields of 90 bushels have frequently been obtained. It is also an excellent fodder corn.

Reid's Yellow Dent.

This is a moderately tall-growing variety which takes much the same time to mature as Star Leaming. The ears are cylindrical in shape, of good size, and usually carry from sixteen to twenty rows of very tightly packed grain. It is of a pale amber colour at the base, with a creamy-coloured cap and a rough crease dent. The stalks are light and leafy and make excellent fodder. Like Star Leaming, this is a very suitable variety for early cropping and for districts which have a short growing season. This is an exceptionally heavy yielder, and yields of over 100 bushels have been obtained.

Funk's Yellow Dent.

With this variety the growing period, and many of the habits of growth, are very similar to Reid's Yellow Dent. The grain is also very similar in appearance, the only difference being that it is somewhat squarer on the crown and has not as rough a dent. This is also a very good variety for early sowing, but is not quite as heavy a cropper as Reid's.

Golden Beauty.

This is a fairly tall growing, medium late variety, taking approximately four and a-half to five months to mature. The ears are long with a very light core, and usually carry twelve rows of grain. Husk covering is particularly good and the ears turn down very well when ripening. The grain is not so deep, but much broader than that of the varieties already discussed. It is a bright amber in colour with a cream-coloured cap and a long crease dent. This is an excellent yielder, and is a very hardy variety, and will stand up to dry conditions much better than most varieties. The grain when shelled makes a particularly attractive sample and will always command top price on the markets.

Improved Yellow Dent.

This variety is now also known as Fitzroy, which has caused considerable confusion and many growers are purchasing seed thinking they are getting some new variety. It is a late-maturing variety, taking approximately five and a-half months to mature, and is without a doubt the heaviest cropper of any variety grown in Queensland to-day. The ears are large and cylindrical in shape, with usually sixteen to eighteen rows of grain. The grain is deep and wedge-shaped, of a rich amber colour, with a bright yellow cap and a rough crease dent. Husk covering is very good. For coastal districts and jungle or rain forest lands, where there is a good rainfall, this is without a doubt the best of the late-maturing varieties. A yield of 117 bushels an acre was obtained from an 8-acre Departmental propogation plot in the Imbil district.

Of the white varieties, Boone County, White, and Silvermine have given the best all-round results. Both are good croppers and produce fairly large ears carrying a deep grain with a rough to a slightly pinched dent. They are also fairly hardy varieties and are excellent fodder corns.

Regarding red varieties, the growing of these has been discontinued by the Department mainly owing to the fact that red grain will not now be accepted for export purposes.

The yellow varieties already discussed have also proved to be equally as good and in some cases better than the best of the red varieties, and it would therefore be unwise to encourage the production of a class of grain which could not be exported.

COLOURING MATURE CITRUS FRUITS.

ACETYLENE GAS TREATMENT.

By R. L. PREST, Instructor in Fruit Culture.

IN recent years citrus growers have realised the value of marketing their fruit showing a normal ripe colour having clean and unblemished skins.

Certain varieties of oranges and mandarins are satisfactory and desirable food although still green in colour. When left on the tree to become fully coloured their eating quality deteriorates. In some districts the adverse weather conditions experienced later in the season frequently results in skin blemished and scalded fruit, which, if not a total loss, are greatly reduced in market value.

High grade lemons should always be picked green on reaching their normal size and maturity.

The green colour suggests immaturity and is against the satisfactorily marketing of the fruit. During recent years it has been found that the introduction of certain gases, such as carbon monoxide, acetylene, and ethylene, during the sweating process, accelerates the colouring of mature citrus fruits. Again this should be of assistance to orderly marketing if inter-district co-operation was practised more fully.

To colour satisfactorily the fruit should have reached a certain degree of maturity, if too green and immature it will not develop its normal colour. All citrus fruits must now pass the State and Federal maturity standard, thus safeguarding the public from the sale of immature fruit whether green or coloured. The value of colouring to the citrus industry must therefore be patent to every commercial grower.

Careful Handling Essential.

All fruits to be coloured require additional care in their handling. Bruises show up as greenish areas, oil liberated from the rind may cause spotting. If oil or bordeaux sprays remain on the fruit it will be found that it will come from the colouring room spotted and unsightly.

Any ordinary room lined with timber can be used providing it is air-tight. Where colouring is to be practised on a commercial scale, a chamber having double walls insulated with sawdust, fitted with an air-tight door and draught port on the opposite wall should be constructed. A convenient and economical size would be one to hold 40 to 50 bushel cases, allowing 5 cubic feet of air space to each bushel case, the chamber would require to be of from 200 to 250 cubic feet capacity. Where larger numbers of cases are to be treated it will be found more satisfactory to build two medium-sized rooms in preference to one large one.

For oranges, lemons, and mandarins an average temperature of between 65 and 75 degrees Fahrenheit will prove satisfactory. If the temperature falls below 65 degrees the process will be retarded. The fruit is not likely to be affected by high normal temperatures, up to 89 degrees has shown no ill effect. However, the humidity will require adjusting; in the case of a very dry atmosphere an open vessel of water may be introduced to prevent withering. Where the humidity is high and likely to cause softening, it may be reduced by placing sand, caustic soda, or quicklime on the floor of the chamber.

Method and Equipment.

Fruit to be coloured should be graded for colour and loosely packed into open cases having plenty of ventilation. Dunnage should be used in stacking in order to have an air space round each case.

In a suitable container place the required quantity of carbide.

A second vessel containing water should be arranged in such a manner as to permit the water to slowly drip on to the carbide to generate the acetylene gas.

This apparatus may be fitted either inside or outside the chamber, if the latter, the gas will have to be led into the chamber by means of suitable piping.

Close the chamber, making sure that it is air-tight, allowing it to remain closed for four hours.

Open up the chamber and thoroughly air it for at least two hours.

Between nine and fifteen charges should be sufficient to give mature citrus fruits their normal colour.

It was found that a very small quantity of acetylene gas, 1 part in 2,500 to 1 part in 1,875, satisfactorily coloured matured citrus. To determine the dosage the air space remaining after the chamber has been loaded must be known.

One ounce of carbide generates sufficient gas for every 75 cubic feet of air space.

For practical purposes allow 1¼ cubic feet displacement for each bushel case of fruit.

For example the following table illustrates the dosage required for a chamber of 200 cubic feet capacity with varying numbers of cases.

Size of Chamber.	Number of Bushel Cases.	Air Space.	Dosages.
200 cubic feet	40	150 cubic feet ..	2 oz. of carbide
200 cubic feet	20	175 cubic feet ..	2¼ oz. of carbide
200 cubic feet	10	187½ cubic feet ..	2½ oz. of carbide

The above treatment does not in any way improve the sugar contents or the eating quality of the fruit. It does, however, improve the carrying quality of the fruit, the skin being of a much finer and tougher quality.

The average cost of the colouring by means of acetylene gas works out at about one-seventh of a penny per case. This does not include the cost of the erection of the chamber.

AUGUST TOBACCO SALES.

DALGETY and Company, Limited, Brisbane, report having held their third auction sale of tobacco leaf at the Wool Exchange on 25th August, when they submitted a catalogue of approximately 70 tons of leaf drawn from all the principal growing districts of the State.

Growers' parcels were received from Mareeba, Dimbulah, Bowen, Sarina, Woodstock, Bilwon, Hervey's Range, and other consignments were forthcoming from Texas, Inglewood, Yelarbon, and Killarney.

Competition for Northern leaf was keen and prices realised compared most favourably with the last sale, the prices obtained being considered highly sastisfactory. The average price realised for the 60 per cent. of the offering disposed of was a fraction under 30d. per lb., a really good average considering the various grades and qualities that were offered. The unsold lots comprised immature leaf or leaf that had been over-conditioned, mainly the former.

Offerings from the North at this sale were not quite equal in quality to those of last month, but on the whole the leaf was quite in keeping with what is grown in those parts. The top price secured was for a line of Mareeba leaf, 48d., and Elphinstone and Kirby Ltd., Bowen, had another very satisfactory price, their top price being 47d. The latter growers have placed Bowen on the map as a tobacco-growing district, and it has been established now beyond all doubt that this district can grow leaf equal in quality to the best; this is evidenced by the strong competition this leaf brings at every sale.

The B.A.T. Company were again the principal buyers, bidding freely for all suitable leaf, but would not compete for anything that showed signs of immaturity.

The inquiry for Southern Queensland offerings was very limited and the bulk of the withdrawals came from this section of the catalogue.

We once again desire to warn growers against consigning immature leaf to Brisbane. The tendency of some is to forward consignments to Brisbane for sale, knowing full well that they are unable to dispose of same locally, in the hope that buyers can be found here; this is a false idea because immature leaf is not saleable.

Growers in consigning such leaf to market are acting entirely against their own interests by incurring the unnecessary expense of freight and other charges, as in most cases it will be found necessary to return the leaf.

The following are some of the principal realisations:—

Account L. Strachan, Chewko—1st and 2nd graded, 40d.; account F. C. Crappa, Bilwon—1st graded, 36d.; account Olufson Bros., Woodstock—mixed graded, 38d.; account G. B. Chandler, Major's Creek—mixed graded, 40d.; account Mitchell and Bagge, Dimbulah—1st and 2nd graded, 40d.; account G. Elias, Woodstock—1st and 2nd graded, 41d.; account W. T. Beesley, Chewko—1st graded, 40d.; account A. W. Roger, Bilwon—1st graded, 36d.; account Keith Power, Park Ridge—1st and 2nd graded, 42d.; account Bonomi and Andiloni, Woodstock—1st and 2nd graded, 40d.; account Reid and Pannell, Sarina—1st and 2nd graded, 44d.; account D. Brown, Woodstock—1st and 2nd graded, 41d.; account M. Breen, Mackay—2nd graded, 41d.; account S. Drovandi, Biboohra—1st and 2nd graded, 40d.; account B. F. McDougall, Dimbulah—1st graded, 39d.; account Wakely Bros. and Tobin, Millaa Millaa—1st graded, 46d., 2nd graded, 42d.; account W. F. Beatty, Sarina—2nd graded, 40d.; account Vaughan and Hyatt, Koumala—1st graded, 40d.; account Teitzel and Davey, Bowen—1st and 2nd graded, 40d., 2nd graded, 39d.; account Mrs. D. A. Voice, Sarina—1st and 2nd graded, 42d.; account A. Villata, Woodstock—1st and 2nd graded, 40d., 2nd graded, 39d.; account P. Canavan, Woodstock—1st and 2nd graded, 42d., 2nd graded, 41d.; account Mareeba District Hospital, Mareeba—1st graded, 48d.; account Neirotti and Cecchi, Woodstock—1st and 2nd graded, 42d., 2nd graded, 40d.; account N. G. Weik, Tamworth, N.S.W.—1st graded, 42d.; account G. Foster, Hervey's Range—1st graded, 40d., 2nd and 3rd graded, 39d.; account A. Albeitz, Bowen—1st graded, 40d.; account Andreatta Bros., Woodstock—1st and 2nd graded, 41d., 2nd graded, 41d.; account J. Pesco, Woodstock—1st and 2nd graded, 41d., 2nd graded, 40d.; account W. Lynch, Bowen—1st and 2nd graded, 45d., 3rd graded, 42d.; account J. S. Petersen, Sarina—1st graded, 45d.; account F. P. Murray, Sarina—1st graded, 42d.; account J. Mellon, Bowen—1st graded, 42d.; account H. A. Bojack, Home Hill—1st and 3rd graded, 40d., 2nd graded, 44d.; account T. Hughes, junr., Sarina—1st graded, 42d.; account Petersen, Son, and Strid, Sarina—1st special graded, 48d., 1st graded, 40d.; account J. P. Jackson, Sarina—1st graded, 42d.; account Eller and Tasane, Sarina—1st and 2nd graded, 44d., 2nd graded, 43d.; account Elphinstone and Kirby, Ltd., Bowen—1st and 2nd graded, 47d., 3rd graded, 45d.

WHEAT BOARD ELECTION.

The result of the voting conducted at the Department of Agriculture and Stock in connection with the election of five growers' representatives on the State Wheat Board was as follows:—

DISTRICT NO. 1 (DALBY-MARANOA).	
Ernest Ambrose Thomas (Hunterton, via Roma)	175
*Aaron Hoskin (Jimbour)	166
DISTRICT NO. 2 (PITTSWORTH).	
*Thomas William McIntyre (Yarranlea)	493
Arthur Carl Krieg (Brookstead)	453
DISTRICT NO. 3 (WARWICK-KILLARNEY).	
*Bergittinus C. C. Kirkegaard (Freestone)	356
Herbert George Hughes (Tannymorel)	160
Alexander Nicholas Allen (Campbell's Plains)	42
DISTRICT NO. 4 (ALLORA-CLIFTON).	
*John Edward Nussey (Allora)	358
John Edwin Maher (Allora)	169
DISTRICT NO. 5 (TOOWOOMBA).	
*Wilfred John Brimblecombe (Kingsthorpe)—Returned unopposed.	

* Present member.

One candidate is to be elected for each district, and their term of office is for one year.

HINTS TO CANEGROWERS.

Mr. Edmund Jarvis, Entomologist at Meringa, near Cairns, has submitted the following entomological advice for September to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Hints on Grub Fumigation.

During this month, many growers will be considering whether to fumigate their cane grubs, several, indeed, having placed their orders for the purchase of fumigants early in August. It has now been amply demonstrated by practical field work that in the event of soil conditions being suitable for such fumigation, success can be obtained with either carbon bisulphide or paradichlor. During each season a period usually occurs in which the soil is in an aerated condition (known as "open"), when excess of moisture has drained away from the inter-spaces between the soil particles, thus allowing more air to fill these inter-spaces and penetrate to the bottom of the cultivated soil. These favourable conditions generally happen at a time when grubs are in the second and third stages of development, and include in their ranks those which may have resulted from secondary emergences of greyback beetles. Act promptly at such times.

Should the price of paradichlorbenzene become practically prohibitive, farmers would do well to use carbon bisulphide, the cost of which is about £2 per drum containing 60 lb.

The Beetle Borer Starts Work.

As the season advances, giving place to milder temperatures, the activities of our weevil borer of cane gradually become more noticeable. Crops situated on low-lying land should now be inspected, and evidence of attacks by this pest to basal portions of sticks reported to the Entomologist at Meringa without delay.

Be Prepared to Fight Cane Insects.

Supplies should now be procured of the following insecticides, which will keep from year to year without perishing, and be on the spot in case of an emergency:—

Arsenate of Lead.—This preparation can be obtained in 7-lb. tins at 1s. 6d. per lb.; 56-lb. cases at 1s. 3d. per lb.; and 112-lb. cases at 1s. 1½d. per lb. These prices are f.o.b. or f.o.r. Brisbane.

Paris Green, which costs about 2s. per lb., is a violent poison, and must be kept under lock and key, out of reach of children.

The former insecticide is for use against leaf-eating caterpillars and beetles, which at times prove very destructive to cane leaves. Grasshoppers and "Army-worms" are the chief offenders, and notable invasion should be combated with as little delay as possible. A spray consisting of 1½ to 2 lb. of lead arsenate in about 50 gallons of water has proved quite effective.

Paris Green is used in baits made up for controlling crickets, grasshoppers, and other cane pests.

Care of Spraying and Injecting Hand-Pumps.

No grower should be without a good spray pump; as otherwise he is powerless to repress the activities of the abovementioned, or combat orchard or vegetable pests which make their appearance on the farm from time to time. For field work a Knapsack pump will be found useful for spraying local infestations of army-worms or small beetles eating the leaves of cane. One having a liquid capacity of about 3½ gallons can be carried conveniently, and costs about £2 5s. When buying a spray pump, be sure and see that it be made of brass or copper, and fitted with an effective agitator and large compression cylinder, ensuring even distribution of the chemical being used. Remember that all such machines last very much longer if cleaned thoroughly each time after use; rinse out the container with clean water before putting the pump away, and run plenty of water through the hose and nozzle. Keep the exterior clean and well oiled in all working parts.

The above advice applies also to hand injectors used for fumigating cane grubs, the inside parts of which, such as washers, nuts, &c., are very liable to get out of working order unless properly cared for when put away at the end of the season.

ENTOMOLOGICAL HINTS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Entomological notes from Mr. E. Jarvis, Entomologist at Meringa, near Cairns:—

At the Cairns Show (18th-21st July) opportunity was afforded for meeting many of our canegrowers and having a chat over general matters relating to the control of various insect pests attacking cane. The chief questions discussed were those of (1) grub fumigation; (2) collecting "grey-back" beetles; (3) the protection of such friendly insects as predacious larvæ of "Robber Flies" and "Skip Jack" beetles; and (4) the Digger Wasps and Tachinid fly parasites of our notorious cockchafer beetle and Weevil Borer of sugar-cane.

Considerable interest was manifested by those present in this annual exhibition of the activities of the Sugar Bureau; and thanks are due to the Cairns Show Association for providing accommodation for the display of insects, diagrams, spirit specimens, &c., illustrating the entomological side of sugar-cane.

White Ants attacking Cane Setts and Sticks.

Damage caused by termites (white ants) consists in destruction, by the Worker and Soldier forms of a community, of (1) newly planted setts and the young shoots arising from same; (2) invasion of the setts and growing cane sticks from below ground level; or (3) ultimate removal of the entire internal cellular tissue of the sticks, thus reducing such canes to mere hollow tubes, nothing being left but the rind.

Such injury as that described under No. 3 can be recognised externally by a wilted or brown appearance of the central heart-leaves. Common-sense control methods should be practised when possible, the first step in this direction being a careful survey of the extent of an infested area, with view to discovering sources from which invasions may have originated. Such line of procedure often proves successful on farms where this pest has just made its appearance and has not had time to obtain a secure footing. One should try to trace as far as possible the direction of any tunnels discovered amongst the cane stools. A slender twig from which the bark has been peeled will often be found helpful in such work of tracing a tunnel without risk of losing its direction through friable soils. The grower should also destroy any termitariums (anthills) situated near his headlands by fumigating them with Plume benzine. This can be done by merely removing a piece of the hard exterior casing (about the size of a small saucer) from the apex of the nest and pouring into the cellular interior about a pint of the fumigant. The hole thus made should then be closed up with a lump of moist soil previously consolidated by kneading. Termitariums treated in this way at Meringa gave a mortality when opened up of from 97 to 100 per cent.

Importance of Clean Seed.

During planting operations reject all setts showing indications at the cut ends of termite tunnels or those of either moth or beetle borers. Avoid procuring seed from localities in which the "Giant Termite" (*Mastotermes darwiniensis* Frogg.) or the weevil borer of cane are known to occur plentifully, as by means of such diseased seed these insects often obtain a footing in clean canefields, and may gradually become firmly established.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

General Notes.

Staff Changes and Appointments.

Messrs. A. Boyd, C. Gray, H. Searle, H. Tomkeys, and H. Lowen, of Mount Morgan, have been appointed Honorary Rangers under the Animals and Birds Acts for the sanctuary which includes the property of the Mount Morgan Gold Mining Company Limited.

The following have been appointed members of the Southern District Stallion Board:—A. H. Cory, M.R.C.V.S. (Chairman), S. H. Harding, P. Short, and J. Sprott.

Mr. E. C. Dunn, Inspector of Stock at Boondooma, has been appointed also an Inspector of Slaughter-houses.

Mr. R. E. Soutter, Manager of the State Farm, Roma, has been appointed Wheat Breeder, Department of Agriculture and Stock.

Mr. N. C. Copeman, Inspector of Stock, Department of Agriculture and Stock, has been transferred from the Helidon Cleansing Area to the Kingaroy Cleansing Area.

Messrs. C. W. Knack (Broadmere, Taroom) and T. D. Hall (Wythburn, Taroom) have been appointed Honorary Stock Inspectors.

Mr. C. S. Smith, Accountant, and Mr. B. W. Lennon, Mill Superintendent, of Mount Morgan Limited, have been appointed Honorary Rangers under the Animals and Birds Acts in respect of the sanctuary at Mount Morgan.

Messrs. W. V. McClelland and F. A. Goodman, Overseers of the Mount Spec and Cairns-Port Douglas Roads, have been appointed Honorary Rangers under the Native Plants Protection Act.

Messrs. T. Bryant, Toogoolawah, and William Meharg, Eukey, have been appointed Honorary Rangers under the Animals and Birds Acts.

The Officer in Charge of Police at Biloela has been appointed also an Inspector under the Slaughtering Act.

Constables W. R. Perry (Palmwoods) and W. J. Falvey (Cleveland) have been appointed also Inspectors under the Slaughtering Act.

Mr. St. G. Thorn has been appointed Bacteriologist at the Animal Health Station, Yeerongpilly.

The Officer in Charge of Police, Kajabbi, has been appointed also an Acting Inspector of Stock.

Mr. D. F. Stewart, of the Veterinary School, University of Sydney, has been appointed a Government Veterinary Surgeon, and will be stationed at the Animal Health Station, Yeerongpilly.

Atherton Maize Board.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, extending the operations of the Atherton Tableland Maize Board for a period of ten years from 1st July, 1933, to 30th June, 1943.

A Notice of Intention to extend the Pool was issued on the 17th March last, and growers were given the opportunity of petitioning for a poll on the question of whether or not the Pool should be extended. A petition was received, and a poll conducted on the 12th July, which resulted in 136 votes being cast in favour of continuance, and 104 against. The Order in Council issued to-day accordingly provides for the desired extension of the Pool Board for a further ten years.

Banana Board.

The Governor in Council has approved of the issue of an Order in Council renewing for a further twelve months the levy for the maintenance of the Banana Industry Protection Board.

Assessment at the rate of 1½d. per case containing one and a-half bushels or less for all bananas marketed in the case and 2d. in the £ or part thereof on the proceeds of sales of all bananas marketed in the bunch, was levied during last year, and this will again be enforced this year.

Sanctuary at Lockyer.

An Order in Council has been issued declaring "Springbrook," the property of Mr. K. Rossiter at Lockyer, a sanctuary under the Animals and Birds Acts. It will now be unlawful for any person to take or kill any animal or bird on this property. Mr. Rossiter's son, Mr. H. K. Rossiter, has been appointed an Honorary Ranger for the purposes of the sanctuary.

Tomato Marketing.

An Order in Council has been issued under the Fruit Marketing Organisation Acts, providing for the acquisition of tomatoes by the Committee of Direction of Fruit Marketing for the period from 15th September, 1932, to 15th December, 1932. A regulation was issued on the 14th July last, empowering the Committee of Direction to conduct a ballot of tomato growers to decide this question, and the ballot which closed on 13th August resulted in 70.71 per cent. of the votes polled being in favour of the acquisition. The Order in Council to give effect to the acquisition has now been issued, and will apply to tomatoes produced within those districts which may be briefly described as the area bounded on the north by Rockhampton, on the west by Rosewood, and on the south by the New South Wales border, and including the islands in Moreton Bay. The acquisition is desired for the purpose of ensuring that tomatoes consigned to Southern markets conform with the present maturity standard, are unblemished, and correctly graded.

Peanut Board Election.

The election of two members on the Peanut Board resulted as follows:—

District No. 1 (Wienholt and Nanango)—

Norman James Christiansen (Wooroolin) .. .. .. 87 votes.

Frederik Christian Petersen (Kingaroy) .. .. .. 73 votes.

District No. 3 (Rest of Queensland)—

Albert George Whiting (Atherton), returned unopposed.

Messrs. Christiansen and Whiting will therefore be appointed for a term of two years, as from the 28th August.

Brand Registration Fees.

Regulations have been issued under the Brands Acts, which provide that the brands fees shall, in future, be as follows:—

	£	s.	d.
For the first registration of a Horse and Cattle Brand (other than a symbol brand)	1	0	0
For the registration of a Symbol Brand	7	10	0
For the registration of a Cattle Earmark	1	0	0
For the registration of a Cancelled Horse and Cattle Brand ..	3	0	0
For the registration of a Sheep Brand consisting of one or more letters of the alphabet, or numerals, or of a letter and numeral	0	5	0
For the registration of a Sheep Brand consisting of a sign or symbol or conjoined letters or numerals	3	0	0
For the registration of a Sheep Earmark	0	10	0
For the transfer of a Horse and Cattle Brand	0	10	0
For the transfer of a Sheep Brand and Sheep Earmark	0	5	0

Pests and Diseases of Tobacco.

Executive approval has been given to the issue of a Proclamation under the Diseases in Plants Acts, declaring the following pests and diseases of tobacco to be pests and diseases within the meaning of the abovementioned Acts:—Black Root Rot, Black-shank of Tobacco, Blue Mould, Damping-off Fungi, False Wireworm, Frog-eye, Green Tobacco Looper, Leafhoppers, Mosaics, Phyllosticta Leaf Spot, Tobacco Stem Borer, and Wireworms.

An Order in Council has also been issued which will provide that every occupier or owner of land used in the growing of tobacco plants shall uproot, and where practicable, destroy plants by burning, within one month after the completion of the harvesting of the tobacco leaf. Every paddock shall be treated in the above manner, and where there have been plantings at separate intervals in different parts of one area, similar action must be taken after harvesting of the leaf from each separate planting.

Pineapple Levy.

Executive approval has been given to the issue of Regulations under "*The Fruit Marketing Organisation Acts*, 1923 *to* 1930," empowering the Committee of Direction of Fruit Marketing to make a levy for the purposes of the said Acts on all pineapples marketed for the year ending 19th August, 1933.

The Regulations provide that the levy shall be payable by growers of pineapples on the basis of the quantity of fruit marketed, and shall be at the following rates:—

(1) One penny per case on all pineapples sold, or consigned whether by rail, road, or boat, to factories.

(2) One farthing per ton on all pineapples sold, or consigned by rail to any agent, person, or firm in Queensland, other than a factory.

(3) One halfpenny per case, with a minimum of 1d. on all pineapples sold, or consigned otherwise than by rail to any Queensland railway station to any agent, person, or firm, except a factory.

The levy shall be deemed to have been made upon publication by the C.O.D. of particulars of such levy.

All agents or persons who at any time hold moneys to the credit of growers shall pay to the C.O.D. the amount of levy payable by the growers concerned.

The levy on all pineapples railed from any Queensland railway station (other than Townsville, Rockhampton, Roma Street, Woollongabba, Brunswick Street, South Brisbane, or Central stations) to any other railway station in the State, and not consigned to factories, may be collected by the Commissioner for Railways to the extent of ¼d. per ton.

Subject to the above, and except as hereafter provided, the levy in the first instance shall be collected—

(1) On all pineapples sold or consigned to factories, whether by rail or otherwise, by the C.O.D. to the extent of 1d. per case.

(2) On all pineaples sold or delivered otherwise than by rail to any Queensland railway station to any agent, person, or firm, other than a factory, at the rate of ½d. per case, with a minimum of 1d.

The levy shall be collected in the case of agents or persons other than the C.O.D. or the Commissioner for Railways, by means of levy stamps, obtainable from the Head Office of the C.O.D., Brisbane, which shall be affixed to account sales. Such agents or persons will be entitled to deduct the value thereof from moneys held to the credit of growers, and levies so collected shall be paid to the C.O.D., Turbot street, Brisbane.

In the case of pineapples sold privately by the grower (that is, fruit not delivered to any agent or sent away by rail), the grower must furnish the C.O.D. with a monthly statement of sales, and pay the levy at the Head Office.

If the amount of levy is not collected by the Railway Commissioner or by the agents or persons concerned, then without prejudice to the liability of the Commissioner or agent, such shall be payable by and recoverable as a debt from the grower.

Any agent, person, or company which receives pineapples for sale on commission shall permit any authorised officer of the C.O.D. to inspect their books and accounts.

The sums raised by the levy shall be expended by the C.O.D. in the interests of the pineapple industry of Queensland.

These regulations differ from previous regulations in regard to the pineapple levy, in respect of the arrangements made with the Commissioner for Railways to collect the levy on behalf of the C.O.D. on pineapple consignments in Queensland, with the exception of those from Townsville, Rockhampton, and Brisbane.

Acquisition of Canary Seed.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, vesting in the Canary Seed Board the ownership of all canary seed grown in Queensland. On the 23rd June last a Notice of Intention to make this Order in Council was issued, and growers were given the opportunity of petitioning, before the 25th July, for a poll on the question. No petition, however, was received, and the Order in Council, as abovementioned, has now received Executive approval.

Plane Creek and Racecourse Sugar Levies.

Regulations have been issued under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1930," empowering the Plane Creek Mill Suppliers' Committee to make a levy of one-half penny per ton on all sugar-cane supplied to the Plane Creek Mill, and also empowering the Racecourse Central Mill Suppliers' Committee to make a levy of threepence per ton on all sugar-can hauled over the Silent Grove tramline to the Racecourse Central Mill. Both levies will be used for financing farmers' representatives at the Plane Creek and Racecourse Central Mills. Suppliers to the Plane Creek Mill, and suppliers to the Racecourse Mill in the Silent Grove district, are given the opportunity of petitioning, on or before the 5th September, 1932, for a poll to decide whether or not the abovementioned levies shall be made.

Dairy Science School.

It was very pleasing to note the success which attended the first Dairy Science School held by the Department in Toowoomba, said Mr. F. W. Bulcock, Minister for Agriculture and Stock, recently, in discussing the matter of the extension of the educational activities of the Department. The school at Toowoomba was held for the benefit of butter and cheese factory operatives and proved an outstanding success, members attending from all parts of the Darling Downs. The comprehensive range of lectures was no doubt responsible for such a good attendance, continued Mr. Bulcock. A feature of the programme arrangement which appealed to many members was the segregation of subjects, which permitted those not able to attend the whole course to be present on the days of special interest to their particular section of the industry, whether butter or cheese. The interest in the school was also increased by the lectures delivered by factory officials of wide experience. These lectures led to many interesting discussions, and were undoubtedly of great value to the younger members of the school. The Department, said Mr. Bulcock, was indebted to those who had co-operated so wholeheartedly towards the success of the course.

It is proposed to hold a further Dairy Science School at Maryborough from the 22nd to 26th August on similar lines to that conducted at Toowoomba.

PLATE 126.—SCRYMGEOUR.

Mr. J. T. Scrymgeour, of the Netherby Stud, Warwick, and his champion Shorthorn bull "Netherby Royal Challenge," at the Brisbane Show. Mr. Scrymgeour's success was a popular one. Though handicapped by complete loss of sight, the result of wounds received on active service with the Australian Imperial Force, he carries on a notable Shorthorn stud with a great show ring record.

Rural Topics.

The Sheet Anchor of Human Salvation.

Mr. Henry Ford, the American millionaire producer of motor vehicles, also has a strong leaning to the land as the sheet anchor of human salvation. In a series of articles now running in the American Press he says: "The land! That is where our roots are. There is the basis of our physical life. The farther we get away from the land the greater our insecurity. From the land comes everything that supports life, everything we use for the service of physical life. The land has not collapsed or shrunk in either extent or productivity. It is there waiting to honour all the labour we are willing to invest in it, and able to tide us across any dislocation of economic conditions. No unemployment insurance can be compared to an alliance between a man and a plot of land. With one foot in industry and another foot in the land human society is firmly balanced against most economic uncertainties. With a job to supply him with cash and a plot of land to guarantee him support the individual is doubly secure. Stocks may fall, but seedtime and harvest do not fail." But they do fail, sometimes, in Australia, and even Mr. Ford's own country—"God's own country"—is not altogether immune against crop failures. Still, Mr. Ford is mainly right.—"The Queenslander."

Tattooing Live Stock.

According to Mr. Con O'Sullivan, of Greenmount, Queensland, Higgins' Tattoo Ink is the best ink of all for ear and body tattooing. He has used this ink with success on a large number of calves and older cattle, and states that identification is simplified and the job much more satisfactory when such a permanent ink is used. He is not sure whether this could be obtained in powder or paste form, but knows only the fluid ink in actual practice.

Cheap Pumping—Hydraulic Ram.

Any one having a spring, flowing well, waterhole, or stream on the farm from which can be secured a flow of two gallons or more a minute, and a difference in elevation of 3 feet or more, might install a hydraulic ram that will automatically pump part of the water to the house, barn, or any other part of the farm at practically no operating cost. Once started, if properly installed and adjusted, a ram will continue to pump water day and night without any attention other than an occasional inspection. The hydraulic ram utilises the momentum generated by flowing water to elevate a part of the water to a height above the source of supply. While the ram is made to operate on as low a fall as 3 feet, and as small a supply as two gallons per minute, the greater the amount of fall the greater will be the amount of water pumped.

As a general rule there should be 1 foot of fall between the source of supply and the ram for each 6 feet to 12 feet of elevation to which the water is to be pumped. In other words, with 3 feet of fall water can be forced from 18 feet to 36 feet above the ram. Water can be used direct from the ram or from a storage tank which is kept filled by the ram. The most common method is to use a storage tank with waste overflow, so that a large supply is available. To determine if a ram can be used, first find out the flow of the spring in gallons per minute. To do this, dam the water up, and with a short trough or piece of pipe conduct the water into a bucket of known capacity. A kerosene tin, which holds 4 gallons, is useful for the purpose. The exact time it takes to fill the bucket is noted, and the gallons per minute of flow calculated. If the flow is sufficient the next step is to find the head or fall available; that is, the vertical distance from the water supply to the place where the ram can be located and the waste water drained off. If a surveyor's level is not available, an ordinary carpenter's level can be used for determining the head or fall. The horizontal distance through which the head is obtained should also be noted.

The third step is to measure the height to which the water is to be raised above the ram; that is, the height of the storage tank above the ram. The horizontal distance from the ram to the storage tank must also be known. After all this information is secured the approximate amount of water delivered per hour can be determined by the following simple method:—Multiply the number of gallons the spring flows per minute by the fall or head. Multiply this by 40; then divide the result by the number of feet the water is to be elevated above the ram. The result will be the approximate number of gallons delivered per hour. After making the above measurements and calculations, if it is found that a ram will deliver sufficient water, write any reputable manufacturer or dealer in hydraulic rams, giving the measurements as explained above.—The "Country Gentleman."

Price of Farm Products.

"The Prairie Farmer," always a staunch champion of the man on the land in the United States, waxes indignant over the failure of politicians and "big" business men to realise the urgent need for measures to assist the farmer to get better prices for his produce:—"The collapse in values, hunger, and want in a land of plenty, confiscation of the savings of a generation, are all unnecessary. Once we divert our attention from the privileged classes to the common people, and try to relieve their distress, results can be accomplished quickly. Let us hope that the Liberty Bells that rang out across the prairies of Illinois on 4th July will usher in a new day for the folks who work for a living."

The paper expresses a hope, however, that better things are in store. "Now a saner view prevails. Business leaders wonder how they could ever have imagined that their prosperity could be permanent with the farmers of America unable to buy. They agree now, and so do the political leaders, that higher farm prices must lead the way to better times. The farmer no longer fights alone, and hope for victory grows brighter. There is no reason why farm prices should not be higher. Over-production is largely a myth. Prices of farm products could be doubled without seriously affecting the consumer. In fact, most consumers would be greatly benefited, for that increased farm buying power would open the factory doors and give them their jobs back. What American business and American labour need is customers. Those customers are right at hand—millions of them—on the farms of America. Their needs are endless. They lack only the money to buy, and a reasonable advance in the price of farm products is all that is required to supply that."

The Canadian farmers also are urging prompt action to assist the farming community, and are demanding a special session of the Legislature of the Province of Alberta to deal with a proposal to make the past debts of farmers payable in wheat at a set price. They ask for a set price so that the creditors may be compelled to bear a part of the losses now borne wholly by the farmer. That is one of the world's problems just now—how to adequately compensate the farmer for his toil. He is at the mercy of the winds, and does not know from day to day what is to be the result of his industry. In no other occupation is the return so uncertain. Yet countries like Australia are dependent upon the welfare of the primary producer for their very existence.

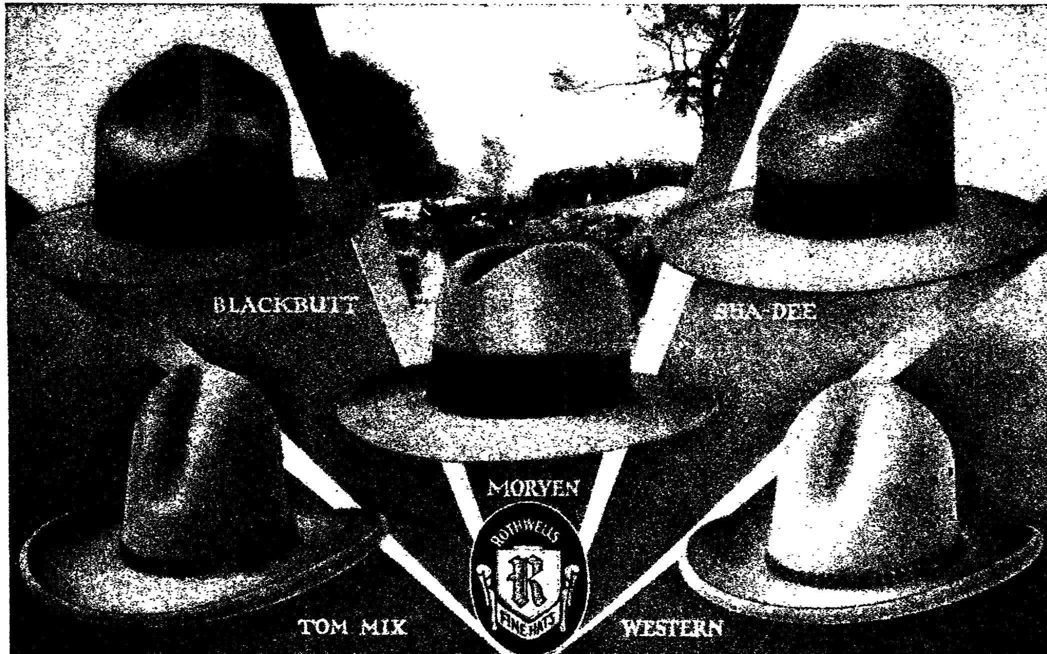
An English writer offers the opinion that land, when all is said and done, is the safest and surest investment for the future. It is the one possible asset that cannot be over-produced. "I know personally several comparatively wealthy men," he says, "who take this view, and who are now looking for, or have bought, land because they consider this the safest of all lock-ups for their capital. I shall be surprised if we do not see this tendency grow, and farmers who own their land or have long-term leases are likely to feel the benefit of this move of capital 'back to the land.'" He points out that, with every commodity except gold, which has no utilitarian value, production to-day exceeds the consumption. But land does not increase. This explains why land, although it has decreased in value, has not suffered depreciation comparable with the depreciation in any other field.—"The Queenslander."

An Appeal to Youth.

Preaching at Chatswood (Sydney) Presbyterian Church recently, Rev. G. R. S. Reid, ex-Moderator, spoke of the need for national unity and co-operation between all sections, for the good of the community. Different classes of people, he said, needed to recognise their mutual dependence upon one another. The divine ideal for the State and the Commonwealth could only be reached by common devotion to God and by common loyalty to each other, all learning to live and work together in harmony with His will and purpose. It was a task which called for the united service of all. It demanded the experience and steadiness of age, and also the energy and enthusiasm of youth. They must look to the young to produce leaders who would guide the country to higher levels. Men were needed with Christian character and principle and a sense of personal honour, public duty, and civic responsibility. It was time Christian people took a united stand against godless communism, and made the church a real force for truth and righteousness in the nation.

Economical Calf Ration.

Calves started on whole milk and later changed to a gruel at the Maryland Experiment Station made rapid gains and at a cost of $19.61 for the first six months of age. The gruel was made as follows:—1 part dry skim milk, 1 part ground oats, 1 part wheat bran, 1 part corn meal, ½ part linseed meal, 1 per cent. salt. Calves liked the dry skim milk, and one part extra was added to the gruel until calves were sixty-three days old, when the above formula was used, until they reached three months of age, when milk was discontinued, and the grain mixture without milk was fed until calves were six months of age.



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Live Stock Sense.

It is a well-known fact that some animals have the powers of sight and smell developed to an exceptional degree, others have a keen sense of hearing. The racehorse has powers, unheard of, even in human life; the trained sheep dog has the sense to understand every word and sound his owner makes during the exciting sheep-dog trials, now a feature at Agricultural Shows; the wolf and many other wild and domestic animals have a very keen sense of smell and can follow a trail for many miles. Science has, in recent years, definitely proved that domestic animals have an equally keen sense of taste just as human beings have under modern conditions of life. It has been proved also that good use can be made of this sense of taste in giving animals the opportunity to select for themselves, a diet that is not only balanced but is of advantage in early maturity and rapid growth. It has been pointed out by some overseas authorities that if animals are given the proper chance they will select a diet even more suitable than that compounded by man, but it is not always convenient or possible to give them the free choice style so much preferred.

A noted American poultry specialist, we are told, has a chicken cafeteria where the chickens may have the opportunity of selecting for themselves the foods they prefer from a number of foods placed in containers in convenient areas in the yard.

It will be noted that whereas cattle are particularly careful of the foods they consume and will not attempt to eat coarse or rank grasses, horses will come along and appreciate the grasses the cattle refuse to eat.

Pigs are very fussy over their food, if they are well fed and are not actually hungry; dogs are extremely careful and some dogs can be so trained that they will absolutely refuse to eat any food except that which is given to them by their master or the person in charge.

The hungry, half-starved animals' senses are so dulled that nature asserts itself and the animal will eat almost anything so long as it satisfies the craving for food.

The subject is an interesting one and one that can be put to good use in the feeding and care of live stock; in fact it pays handsomely to study the diet and to provide those foods which give the best results and which are not only productive but are appetising and palatable. The free choice style of feeding has much to commend it and where it can be taken advantage of is well worth trial.

Sowing Wheat—Points in Setting the Drill.

An important operation connected with sowing is the proper setting of the drill according to the variety and condition of the seed. A drill set to sow, say, 50 lb. of Federation per acre will often sow as much as 60 lb. of small "shotty" seed. Treating seed with bluestone also makes a great difference; seed treated with copper carbonate runs more freely than that treated with bluestone. Atmospheric conditions also influence the flow of seed through the drill.

Many farmers make the mistake of taking it for granted that the drill will sow large grain and small grain at the same rate, whereas the larger the grain the more slowly will it run through the drill, and if this factor has not been taken into account the farmer will find himself well astray in his estimate of the amount of seed necessary to sow a particular paddock or area. It is safe to reduce the drill to sow about 40 lb. of "shotty" grain as compared with 50 lb. of an average sample of Federation.

Again, a variety will often vary with the season. Seed harvested before rain, for instance, is appreciably heavier and more "shotty" than the same variety harvested after rain, and the drill should be set accordingly.

The farmer will find it advisable in starting to sow, to weigh the seed used over a known area, when it will be possible to calculate with a great degree of accuracy the amount required to sow the whole paddock.

The cleaning out of the wheat-cups in the drill is another operation that frequently troubles the farmer. If he wishes to keep his paddocks absolutely clean by avoiding a mixture of varieties, he can run out the seed that remains in the drill on to the headlands, but this obviously is not a good practice.

If the drill be examined, an opening will be found in the iron plates at the end of the seed box, and working just inside the hole is the end of the square iron bar that agitates the feeders in the cups. A key is supplied with most makes of drills to fit through the hole in the plate on to the square end of this iron bar. A few turns of the key will soon empty the cups of any wheat they may contain, and the mixing of varieties is avoided with a minimum of trouble and without the waste associated with the tipping of the grain remaining in the drill on to the headlands.—A. and P. Notes, New South Wales, Department of Agriculture.

Getting the Best from the Herd—Intelligent Testing.

Addressing the recent North Coast conference of the Agricultural Bureau, Mr. G. S. Stokes, manager of Kempsey Butter Factory, New South Wales, drew attention to several facts of which dairy farmers in general might well take note.

The system of recording the production of each cow in the herd, said the speaker, was now within the reach of every dairy farmer: "I know that you will take me to task and say that the way things are at the present time, with the low price of butter, &c., you cannot afford it. But I would like to say that I am sure that you must afford it—you cannot do without it. When in times like the present a business man finds that his costs of production are going up and profits coming down, he seeks the reasons, and you are in exactly the same position. Your profits are coming down, and you must find where your weak spots are.

"To get the best out of herd testing it must be used intelligently, and before commencing to cull I think you should set a standard that you intend to work up to; then you can cull a few cows each year that do not come up to the standard you have set, starting on a reasonably low standard, say, the average of the cattle throughout the State for the previous year. Each year you could then set yourself a higher standard."

With regard to the causes of cream being graded into seconds, the speaker pointed out that uncleanliness was undoubtedly the chief source of trouble.

"The use of cold water for washing up is far too common, especially at night. Then we find that, although dairymen start off with hot water they usually finish up using cold water, and not only cold water, but water which, by the time they are finished, is mixed with milk and dirt which has been washed off the utensils.

"There is only one way to clean utensils properly, and that is by having scalding water to finish up with. By this I mean that the utensils should be first washed in lukewarm water to which a little soda has been added, then thrown into boiling water and allowed to lie there for at least five minutes. Then when they are lifted out they should be dried immediately, and bacteria have no chance of multiplying on their surface, as all the bacterial food is washed off. The utensils should then be hung up in a clean place. Brushes only should be employed in washing—rags should on no account be used in the dairy."

Dairy farmers were recommended to follow the "three C's" by keeping their cream clean, cool, and covered.

Benzine Cans as Milk Containers.

Benzine cans are frequently converted into buckets and used for holding milk and cream and for other purposes. As ordinarily used, however, they are objectionable owing to the grooved seams round the bottom and in the corners, as well as where the top has been cut out. Rust soon forms in these crevices, and as they cannot be easily cleaned they act as lodging places for decaying milk and cream.

To make such tins suitable receptacles for milk and cream, the grooved and folded seams and the cut seam at the top should be smoothly flushed with solder prior to use. The bottom corners of these improvised cream buckets are the most difficult to keep clean, and a good plan is to melt a little extra solder into these corners to form a smooth triangular-shaped filling. If all the seams are treated in this way a very useful and sanitary dairy utensil will be provided, and the life of the can will be greater.

Deep Tillage.

The only true test of good farming is to produce the maximum yield per acre at the minimum cost consistent with good farming. This yield will never be obtained unless the soil is well and truly tilled. Deep tillage on the rich easily worked loams is as good as a coat of dung, for no land can make the best use of manure unless it is suitably prepared to receive the dressing. Again, no amount of merely mechanical working will make the soil fertile unless organic manures, such as dung, or green manures, such as crops of mustard, tares, and clovers, are occasionally ploughed in. Moreover, artificials are needed in addition to the organic manures, for they provide the plant with nourishment that is easily available and ensures it having a kick-off at the start of its career. The soil is the farmer's raw material, and must be treated well if it is to give a paying return, whether this return be in crops or in grass.—"Live Stock Journal" (England).

How to get Quality Milk.

A new Advisory Leaflet (No. 29), issued by the Ministry of Agriculture and Fisheries (Great Britain), gives some useful and interesting notes on circumstances affecting the quality of milk.

Dairy breeds differ widely in regard to the quality of milk, and there are also individual differences with a breed. The ability to produce rich or poor milk seems to be hereditary, this trait applying equally to both parents. The herd owner who wishes to grade-up his herd should, therefore, keep careful yield and quality records of the milk produced by each cow, so that he may be guided in the selection of the cows from which to breed, and he should also exercise every care in the selection of the sire. If the owner favours a particular breed on the ground of quantity production, and desires to raise the average quality of the milk of his herd immediately, it is usually advisable to include a few animals of a "high-quality" breed, such as the Guernsey or Jersey.

INTERVAL BETWEEN MILKINGS.

Uneven intervals between milkings are, perhaps, the commonest cause of wide variations in quality, the butterfat easily varying to the extent of 2 or 2.5 per cent. The farmer should aim at a night interval of not more than thirteen hours, and the heavy-yielding cows should be milked last in the evening and first in the morning.

Quality is often affected by inefficient milking. Milking should be done quickly, quietly, and thoroughly, the cow being treated with every consideration. Thorough stripping is essential, as the fat content of the last milk so obtained is often as high as 7 or 8 per cent. Moreover, rough stripping will result in loss of butterfat and injury to the udder muscles.

As the chemical quality of milk from individual cows varies, the milk should be bulked in the churns so as to represent the average quality of the herd. Any high-quality cows should be so housed as to ensure an even distribution of their milk throughout the bulk. Proper bulking is particularly important where milk is bottled on the farm; neglect of it has led to wide variation of fat content in the highest grades of milk.

Contentment, which is fostered by comfortable housing, ample light, and ventilation, tends to increase the general quality of milk produced. The quality is often affected by indisposition, recent calving, chill of the udder, abnormal conditions, and any unusual excitement. The general condition of individual cows should, therefore, be kept under observation by stockmen, and during any abnormal period the milk should either be tested or withheld temporarily from the bulk.

BALANCED RATIONS.

Experiments have shown that if a cow is well nourished no alteration or improvement in feeding will permanently alter the quality of her milk. Where, however, a herd is receiving an unbalanced ration containing too great a bulk, too much starchy matter or oil and an insufficient albuminoid and mineral content, improved feeding may raise the general quality of the milk, particularly in the case of a solids-not-fat deficiency.

The solids-not-fat content is sometimes adversely affected when the herd is turned out to spring grass. The reason has not yet been ascertained, but in the meantime it would seem worth while to try the judicious use of suitable concentrates, preferably those low in albuminoid content. Similar care is needed towards the end of the grazing season.

There is frequently a slight depreciation of chemical quality when lactation is extended beyond the normal period (nine to eleven months), and in abnormal old age. These factors are unlikely to influence the quality of milk from the whole herd unless the average age of the cows is unduly high and calving-down in practised only at certain periods of the year. In such cases, the remedy is simple and obvious.

It is improbable that all the above factors will be found in any one herd, but where the chemical quality is low some of the factors will probably be present. The exact cause can be determined only by investigation, based on reliable information. Accurate records of yield, fat content, and solids-not-fat content for the herd as a whole and for individual cows are, therefore, essential. Any producer who experiences difficulty in keeping such records, or requires advice on rationing, should approach the County Agricultural Organiser, who is available to give expert advice and to assist in improving the general standard of milk production.

The Ideal Fallow—The Processes by which it is Obtained.

In order that soil moisture may be available to the roots of the young wheat plant, the fallow must be firm up to within about 2 in. of the surface at time of sowing, observed the Director of Agriculture (New South Wales) in a recent address to wheatgrowers, and in loose open soils the chief problem was to achieve the necessary consolidation. The farmer with a soil of a clayey nature, on the other hand, must cultivate it in such a way that the surface was prevented from setting too hard. With the ideal fallow in mind, the farmer should set out to study the peculiarities of the various classes of soil he had on his farm, and adopt whatever methods were necessary to bring about the desired condition. The work of fallowing might be divided into three parts—first, the opening up of the land by ploughing or scarifying to allow the rain to enter and to give a surface suitable for cultivation; secondly, the cultivation of the land during the year to conserve moisture; and, thirdly, the bringing about of the right degree of consolidation.

Although the first working of the land generally consisted of ploughing, it should not be taken for granted that ploughing was essential. An important thing was that the first working should be done as early as possible. Taking the conditions in that district (Tullibigeal) as an example, the speaker pointed out that recent rains had saturated the soil, and if the land was worked quickly much of the moisture would be held in the soil for the following year's crop, whereas if the work was delayed this moisture would be lost. Ploughing was naturally slow work, but scarifying could be done more rapidly, and it was probable that on much of the light soil of the district that did not set and which absorbed moisture fully, the land could be more efficiently prepared by scarifying than by ploughing. On clay soils which were inclined to set it was necessary to give deeper working than was possible with the scarifier, and it was also necessary to avoid using implements which made the soil too fine. It was for this reason that it was inadvisable to use disc implements.

The Subsequent Workings.

Having completed the first working, the next job was to proceed with the work of obtaining consolidation and of conserving moisture. The first working left the land rough and cloddy, and to bring about consolidation and to help in conserving moisture it was necessary to comb it. This meant bringing the clods to the surface and getting the fine soil down below. Clods underneath were harmful, as they kept the soil loose, but they were useful on the surface, as they broke the fall of heavy rain and prevented compaction of the surface.

This combing was done with the springtooth cultivator, working to the full depth. If circumstances permitted, it should be done as soon as possible after the first working and without waiting for rain. After this was done no further working was given until rain fell. Immediately after each substantial fall of rain the surface should be cultivated in some way. The reason for this was that rain brought all the soil particles together right to the surface and moisture rose freely to the top where it evaporated at a great rate. Moisture could not move in the soil, however, if the soil particles were not touching, and the fallowed land should therefore be kept stirred on the surface to maintain a loose condition which would prevent moisture coming to the top. It was essential also that the work should be done quickly, as up to 1 in. of moisture might be lost per week if the surface was packed.

The depth of working should be decreased with each working with the object of ensuring that when the time came to sow the proper degree of consolidation would have been attained. Just as in regard to the initial preparation, each farmer must decide for himself how and in what way he would cultivate his land. The point that he must keep in mind was that if his soil was somewhat loose he must do everything to ensure consolidation, and the harrows should be used as much as possible. If, on the other hand, the soil was inclined to be fine and clayey and of such a nature that it became too compact after rain he must keep it more cloddy to prevent overmuch compaction. Wherever farmers had any special difficulties it was advisable to consult the local Agricultural Instructor.

Condition Most Conducive to Germination.

The advantages of correct fallowing were not confined to the conservation of moisture. After all, good germination was the main thing, and usually good preparation would lead to good germination. A firm seed-bed about 2 to 2½ in. from the surface with a loose top to act as a cover was in the best condition. Although the roller was not now used to any extent by wheat farmers, as it was generally unnecessary, there was no doubt that it would be useful in those seasons when it had been impossible to get consolidation. It was not possible, however, to get perfect consolidation except with the aid of rain and the adoption of correct methods of working the surface. It was for this reason that the old idea of deep ploughing

had been scrapped in favour of shallow ploughing. In many years there was insufficient rain to consolidate deeply-ploughed land. It might be accepted that the dryer the district the shallower should be the ploughing—taking into consideration the character of the soil—in order to ensure consolidation, so that a good germination would be obtained.

Depth of Sowing.

It was usually inadvisable to sow deeply (more than about 2½ in.), but in dry districts the seed must be put down on the seed-bed even if it was 3 or 4 in. down. It was dangerous, however, to put seed down so deeply, especially in clay soils that packed hard, as heavy rain would probably set the surface and prevent the plants getting through. Under such circumstances the plants could be helped by harrowing as soon as the land would carry the horses. Particular care must be taken to ensure that the seed was put on the seed-bed. Some of the combines did not do this satisfactory as loose soil ran in under the seed before it dropped on to the firm seed-bed. Sometimes also if a drill was drawn too fast by a tractor the hoes hopped and some of the seed was placed in the loose surface soil.—A. and P. Notes, New South Wales Department of Agriculture.

Harvesting Stone Fruits—Points in Picking.

In the harvesting of stone fruit it is preferable that it be picked when cool, but often in the peak period of any variety picking has to proceed throughout the day during very hot weather, and there is very little opportunity to allow it to cool off in the shade before it is packed. Fruit packed while still hot in this way will ripen more rapidly than similar fruit packed when cool. This will not be of much detriment if the fruit has not to be transported far to market and is quickly disposed of, but if the distance is great or sales are slow there is a probability of it becoming too soft before sales are effected.

For these reasons it can be seen that it is necessary for fruit that is to be despatched long distances if hot when picked to be allowed to cool off before packing. This can be done by allowing it to remain in partially filled open boxes which are stacked in the shade in an open manner so that the air can pass over and between the boxes. Any fruit picked during the latter part of the afternoon and not packed till the following morning should be held in the above way.

Fruit should not be packed while wet from rain, though if only wet from a very light passing shower or heavy dew it will soon dry if stacked as above. It is preferable not to pick directly after rain when the soil has been soaked, but often this cannot be avoided, and in some seasons to wait only means running into more rain.

The degree of maturity at which stone fruit is picked depends on the use it is to be put to, the distance it has to travel, and many other conditions. When fruit is grown close to the market it may be allowed to become far more mature before picking than when it has to be transported long distances.

Stone fruits very appreciably increase in size and improve in appearance during the last day or two of ripening, but even when grown close to market it is not always advantageous to wait for this increase in size; for instance, a bare market can sometimes be caught by picking earlier or the greatest demand on the market may be for fruit fit for reconsigning long distances. Generally speaking, when dealing with a large area of any one variety it is wise to start as soon as there is a picking of that variety sufficiently mature for market, for if one waits for larger pickings or greater maturity at the start there is risk of the crop overtaking one when at its height and appreciable losses occurring.

There are certain degrees of maturity at which fruit can be satisfactorily picked for market, and these are governed by several conditions as pointed out above, but these degrees are between two limits which must not be overstepped. The fruit should have reached such a degree of maturity when picked that it will not rapidly wilt, but will continue to ripen and sufficiently develop the flavour characteristic of the variety. On the other hand, it must be firm enough to stand the journey. To ignore either limit causes direct loss to the grower, but the ignoring of the requirement as to ripeness has also a far-reaching effect. The immature fruit or some of it is probably sold at reduced prices and passes into consumption. The consuming purchaser is disappointed and assumes that fruit is not what it used to be, or that it does not agree with him or his family; hence he turns to other foods.

PRODUCTION RECORDING.

List of cows officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, and The Friesian Cattle Society, production charts for which were compiled during the month of July, 1932 (273 days' period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Empress 9th of Rosemount	Mature	13,256·65	521·533	C. O'Sullivan, Greenmount
Daisy VI. of Oakvilla	Mature	10,403·58	415·498	H. Marquardt, Wondai
Red Wings of Bellwood	Mature	10,717·9	403·092	W. G. Currant, Gunalda
Bella 8th of Kilbirnie	Mature	9,586·21	397·145	Macfarlane Bros., Radford
Champion 3rd of Oakvilla	Mature	9,556·28	384·532	H. Marquardt, Wondai
Flower 10th of Rosemount	Senior (4 years)	14,373·75	547·836	C. O'Sullivan, Greenmount
Pensive of Nestles	Senior (4 years)	9,063·91	372·835	H. M. Graham, Goomeri
Plummet of Nestles	Senior (4 years)	7,797·01	342·659	H. M. Graham, Goomeri
Norah 12th of Morven	Junior (4 years)	10,576·4	467·589	R. Mears, Toogoolawah
Beauty of Hillvale	Senior (3 years)	12,681·65	421·560	W. H. Thompson, Nanango
Rosebud V. of Springdale	Senior (3 years)	9,365·85	372·214	V. Dunstan, Wolvi
Pansy of Rockleigh	Senior (3 years)	8,542·7	357·607	T. Strain, Wondai
Princess 9th of Fairlie	Senior (3 years)	8,962·5	353·747	C. B. Mitchell, Warwick
Gwen III. of Golelea	Junior (3 years)	7,507·89	325·364	E. M. Franklin, Wangalpong
Fraulein of Wilga Vale	Junior (3 years)	6,672·62	277·17	C. O'Sullivan, Greenmount
Blacklands Salome	Senior (2 years)	7,671·25	355·791	G. A. Meyers, Imbil
Lovely 4th of Loomhurst	Senior (2 years)	8,243·55	314·047	T. Shuttlewood, Peachester
Lucy 23rd of Millstream	Senior (2 years)	7,785·04	304·637	W. J. Barnes, Cedar Grove
Rosebud of Trevor Hill (265 days)	Senior (2 years)	6,563·65	283·484	Geo. Gwynne, Umbiram
Dahlia 4th of Arley (257 days)	Senior (2 years)	6,117·3	273·655	E. D. Lawley, Maleny
Fussy of Alphavale	Junior (2 years)	10,360·25	388·768	W. H. Thompson, Nanango
Lassie of Glendalough	Junior (2 years)	7,516·75	307·494	J. Lyndon, Worongary
Beauty II. of Golelea	Junior (2 years)	6,679·44	259·915	E. M. Franklin, Wangalpong
Lovely of Trevor Hill	Junior (2 years)	6,463·85	259·407	G. Gwynne, Umbiram
Noami 3rd of Springdale	Junior (2 years)	6,253·6	247·686	T. Shuttlewood, Peachester
Wunulla Stella	Junior (2 years)	5,768·5	246·162	J. Lyndon, Worongary
Favourite of Trevor Hill	Junior (2 years)	6,721·18	237·000	Geo. Gwynne, Umbiram
JERSEY.				
Lady of Calton	Mature	13,361·66	683·834	J. Collins, Tingoora
Marjorie of Newhills	Mature	7,873·5	404·349	J. Nicol Robinson, Maleny
Rosina of Southport	Mature	6,889·0	397·757	F. Porter, Maleny
Westwood Belle	Mature	6,549·25	378·883	F. Porter, Maleny
Newhills Cygnet 2nd	Mature	7,715·15	358·562	J. Nicol Robinson, Maleny
Westwood Cowslip	Mature	5,803·7	351·623	F. Porter, Maleny
Hetty of Calton	Junior (4 years)	9,278·31	497·714	J. Collins, Tingoora
Fern of Brook Lodge	Junior (4 years)	6,274·66	325·865	H. T. Mayers, Nambour
Trecarne Barleybread 2nd	Junior (4 years)	5,418·33	319·583	T. A. Petherick, Lockyer
Ellerdale Carrie 2nd	Senior (3 years)	6,833·8	388·651	H. M. Thomason, Mount Mee
Newhills Maid	Junior (3 years)	5,176·2	330·662	J. Nicol Robinson, Maleny
Rosevale Una	Junior (3 years)	5,354·4	295·895	H. F. Rowe, Kenilworth
Rosevale Bonnie Rose (268 days)	Senior (2 years)	5,439·6	305·142	H. F. Rowe, Kenilworth
Rosevale Gaiety	Senior (2 years)	5,332·85	285·719	H. F. Rowe, Kenilworth
Celia of Calton	Junior (2 years)	8,633·79	461·607	J. Collins, Tingoora
Coral of Calton	Junior (2 years)	6,589·75	338·261	C. Burows, Goomeri
Carnation Larks Violet	Junior (2 years)	5,958·3	324·314	N. Alcorn, Maleny
Crystal of Brook Lodge	Junior (2 years)	5,632·64	318·779	H. T. Mayers, Nambour
Westwood Rosette	Junior (2 years)	4,160·1	284·03	F. Porter, Maleny
Rosevale Sunbeam	Junior (2 years)	5,090·0	278·942	H. F. Rowe, Kenilworth
Wattle of Rosehill	Junior (2 years)	5,517·5	268·362	J. W. Evans, Boonah
Bangle of Rosehill	Junior (2 years)	4,531·04	265·699	J. W. Evans, Boonah
Carnation Trixie	Junior (2 years)	4,347·75	253·136	C. Richards, Maleny
Silver Locket of Burnleigh	Junior (2 years)	4,123·35	248·233	W. Mallett, Nambour
Linda of Calton	Junior (2 years)	4,565·8	238·696	F. J. Cox, Imbil
FRIESIAN.				
Oaklands Holly Rock III.	Junior (2 years)	7,025·86	292·106	W. Richters, Tingoora

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE DIET OF THE NURSING MOTHER.

WE are suffering hard times and much unemployment. How hard the struggle is for many mothers is known only too well by the nurses in our Baby Clinics. In spite of all this the infant mortality (under one year) in Queensland during the year 1931 was much lower than it has been in any previous year. It nearly approaches the infant mortality of New Zealand, which is the lowest in the world. Not Queensland alone, but every Australian State and New Zealand, showed a record for low infantile mortality during 1931. It would seem that hard times, unemployment, and poverty lowered that mortality in all of them. How can we explain these amazing facts?

Very simply. Want of money has prevented many mothers from feeding their babies with artificial foods and compelled them to give their babies their natural food, and has so saved many lives. Though we recognise this, we must recognise also the credit that is due to the people of Australia for providing these mothers with sufficient sustenance. Still more credit must we give to the mothers, who have accomplished such great results in spite of much difficulty under most depressing conditions. Such mothers deserve all the help we can give them, and this is why we are writing about the diet of the nursing mother.

Unless the mother has been actually suffering from partial starvation, increase in the quantity of food taken does not as a rule increase the quantity of her milk. A deficient supply of breast milk is most commonly caused by the failure, for one reason or another, of the infant to empty the breasts at regular interval by sucking. This is fully explained in the Queensland Mothers Book. Other causes are that the mother is doing too much hard work, or has too many worries, or is in poor health. Under these circumstances the mother frequently tries to increase her breast milk by taking more food, and fails. But though the diet may have little influence on the quantity of breast milk, it has much influence on its quality. The mother may be taking a sufficient quantity of food, but unless the right foods are taken her milk may be deficient in the vitamins and other substances, which are necessary for the development of a strong, healthy baby. It is not always so, for nature, always careful of her young, may maintain a good proportion of these substances in the milk by draining the mother's body of its reserves. This is why we sometimes see a perfectly healthy baby being suckled by a sickly mother, to the further deterioration of her health. If this is continued, the mother will ultimately break down, and then the baby will suffer also. Let us consider then the food requirements of the nursing mother.

Mistaken Tradition.

Popular tradition has erred badly. Mothers have been taught to avoid green vegetables, because they are supposed to give the baby wind. Orange juice taken by the mother is said to curdle the milk. If she eats cheese, that is also supposed to upset the baby, and so on. All these are vain superstitions. What is good for the mother is good also for the baby. The first need of the mother is sufficient water. It is a good thing to drink a glassful before each suckling. She does not need a very large quantity of food, she should not force down food against inclination, but she should take the right kinds of food. Three meals a day will suffice. The most important food for her is good fresh cow's milk. This is not only the best, it is also the cheapest food. The simplest way to take it is to drink it.

Should the taste be disliked, flavour it with cocoa. Milk may also be taken as junket or in other ways, and the right quantity is at least a pint a day. If the mother believes that she cannot take milk, she should consult a doctor, for her condition is serious. After milk, butter and eggs are valuable, and if the mother can take cheese, so much the better. A moderate allowance of meat may be taken once or twice daily. Plenty of vegetables, especially green vegetables, are important aids. There remains only the question of bread. Wholemeal bread is recommended, but is hard to get, and what is sold as wholemeal is not always that. Therefore every nursing mother should take a heaped dessertspoonful of wheat embryo (Bemax or Vita B) or a heaped tablespoonful of bran (All Bran or Sanbran) or both, twice a day. If she does not do this, the mother who eats largely of white bread is likely to have a white-faced constipated baby. Some of her bread may be substituted by potato, which is a better food. Indeed it is possible to live healthy on a diet of potatoes and milk alone; but we do not ask our readers to do this.

ONION BED.

It may be looking well ahead, but the onion bed for the next season should be prepared now. Onions require a deep soil—one where the roots can go well down; at the same time it should be firm. The consequence is that if trenching or deep digging is done, it should be done so that the ground can settle and get consolidated before the crop is planted or sown in spring. A good soil is required, but a soil heavily manured with stable manure will produce a large, bulky, but soft bulb that does not keep well. Potash is one ingredient that is absolutely necessary, and for this reason all ashes from wood and rubbish heaps should be scattered on the ground where the onion bed is to be. This can be done during the winter, as the soil holds the potash and does not leach out, as is the case with nitrogen.

PLATE 127.—A PROUD EXHIBITOR.

Miss Scrymgeour, of Netherby, Warwick, and the champion Shorthorn cow at the Brisbane Show—"Netherby Snow Queen."

Orchard Notes for October.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material, and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good, healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy

every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

CLIMATOLOGICAL TABLE—JULY, 1932.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·04	78	63	81	6	50	13, 14	65	4
Herberton	..	67	44	75	24, 31	27	12	92	6
Rockhampton	30·11	74	48	80	22	36	10	25	5
Brisbane	30·10	69	48	75	24	42	15	27	5
Darling Downs.									
Dalby	30·12	65	37	72	4, 5, 24	28	14	97	3
Stanthorpe	..	58	31	65	5	22	16	100	4
Toowoomba	..	61	38	68	24, 30	29	10	114	3
Mid-interior.									
Georgetown	30·03	80	47	84	25, 26, 27	32	12	0	..
Longreach	30·11	73	41	79	4	33	11	0	..
Mitchell	30·15	65	34	73	4	28	14, 28	118	2
Western.									
Burketown	30·06	79	52	86	6	43	11	0	..
Boulia	30·11	72	44	83	3	38	25	0	..
Thargomindah	30·12	64	40	74	4	36	1, 16, 29	53	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. July.	No. of Years' Records.	Total Rainfall. July, 1932.	July, 1931.
North Coast.	In.		In.	In.
Atherton	0·99	31	1·33	0·42
Cairns	1·58	50	1·42	1·27
Cardwell	1·35	60	0·71	0·55
Cooktown	0·98	58	0·65	0·43
Herberton	0·78	45	0·92	0·50
Ingham	1·49	40	1·00	1·11
Innisfail	4·63	51	4·07	1·90
Mossman Mill ..	1·26	19	..	1·01
Townsville	0·61	61	0	0·08
Central Coast.				
Ayr	0·68	45	0·08	0
Bowen	0·90	61	0·40	0·08
Charters Towers ..	0·62	50	0	0·01
Mackay	1·61	61	0·52	0·31
Proserpine	1·35	29	0·70	0·68
St. Lawrence ..	1·25	61	0·19	0·17
South Coast.				
Biggenden	1·31	33	0·30	0·37
Bundaberg	1·78	49	0·49	0·64
Brisbane	2·20	81	0·27	1·78
Caboolture	2·13	45	0·35	1·60
Childers	1·66	37	0·08	0·72
Crohamhurst ..	2·85	39	0·61	1·64
Esk	1·96	45	0·44	1·51
Gayndah	1·43	61	0·45	0·98
Gympie	2·10	62	0·43	0·78
Kilkivan	1·60	53	0·41	1·02
Maryborough ..	1·84	60	0·21	0·81

Divisions and Stations.	Average Rainfall. July.	No. of Years' Records.	Total Rainfall. July, 1932.	July, 1931
South Coast—continued	In.		In.	In.
Nambour	2·64	36	0·40	1·50
Nanango	1·65	50	0·75	0·65
Rockhampton ..	1·39	45	0·25	0·43
Woodford	2·34	45	0·36	1·86
Darling Downs.				
Dalby	1·72	62	0·97	0·96
Emu Vale	1·54	36	1·20	1·60
Jimbour	1·53	44	0·65	0·84
Miles	1·61	47	0·65	0·84
Stanthorpe	2·03	59	1·00	1·95
Toowoomba.. ..	2·03	60	1·14	2·42
Warwick	1·82	67	1·71	1·72
Maranoa.				
Roma	1·42	58	0·53	1·28
State Farms, &c.				
Bungeworgorai ..	1·31	18	0·39	1·24
Gatton College ..	1·34	33	0·64	2·21
Gindie	0·90	33	..	0·55
Hermitage	1·70	26	1·44	1·82
Kairi	1·14	18	..	0·55
Mackay Sugar Experiment Station ..	1.35	35	0·37	0·19

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1932.		October, 1932.		MOONRISE. Sept., 1932.	MOONRISE. Oct., 1932.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·10	5·34	5·36	5·48	6·12	5·52
2	6·9	5·34	5·35	5·48	6·46	6·27
3	6·8	5·35	5·34	5·49	7·21	7·11
4	6·7	5·35	5·33	5·50	7·56	7·59
5	6·6	5·36	5·32	5·50	8·33	8·55
6	6·5	5·36	5·31	5·51	9·16	9·57
7	6·4	5·37	5·29	5·51	10·5	11·2
						p.m.
8	6·3	5·37	5·28	5·52	11·3	12·6
					p.m.	
9	6·2	5·28	5·27	5·52	12·6	1·10
10	6·0	5·38	5 26	5·53	1·9	2·7
11	5·59	5·39	5·25	5·53	2·11	3·5
12	5·58	5·39	5·24	5·54	3·15	3·59
13	5·57	5·40	5·23	5·54	4·13	4·52
14	5·56	5·40	5·22	5·55	5·10	5·43
15	5·54	5·41	5·21	5·55	6·4	6·40
16	5·53	5·41	5·20	5·56	6·57	7·35
17	5·52	5·42	5·19	5·56	7·50	8·29
18	5·51	5·42	5·18	5·57	8·46	9·23
19	5·49	5·43	5·17	5·58	9·42	10·17
20	5·48	5·43	5·16	5·58	10·37	11·10
21	5·47	5·43	5·15	5·59	11·29	11·59
22	5·46	5·44	5·14	5·59	..	..
					a.m.	a.m.
23	5·45	5·44	5·13	6·0	12·24	12·46
24	5·44	5·44	5·12	6·1	1·17	1·27
25	5·43	5·45	5·12	6·1	2·8	2·4
26	5·42	5·45	5·11	6·2	2·52	2·37
27	5·40	5·46	5·10	6·3	3·32	3·10
28	5·39	5·46	5·9	6·3	4·8	3·44
29	5·38	5·47	5·8	6·4	4·42	4·20
30	5·37	5·47	5·7	6·5	5·17	4·59
31	..	..	5·6	6·6	..	5·47

Phases of the Moon, Occultations, &c.

4 Sept.	●	New Moon	5 55	a.m.
7 ,,	☾	First Quarter	10 49	p.m.
15 ,,	○	Full Moon	7 6	a.m.
23 ,,	☽	Last Quarter	10 47	a.m.
30 ,,	●	New Moan	3 30	p.m.

Perigee, 4th September, at 4·48 a.m.
Apogee, 20th September, at 1·54 a.m.

Venus will be at its greatest elongation, 46 degrees west of the Sun on the 8th, when it will rise at 3·25 a.m., being near the border-line of Gemini and Cancer.

Saturn will be 4 degrees north of the Moon as they approach the western horizon before half-past three in the morning of the 11th.

Mercury and Jupiter will appear to be very near to one another, amongst the stars of Leo, when seen in the early morning, especially about the 13th.

About half an hour before setting on the morning of the 15th September, the Moon will be dipping into the shadow of the Earth and showing signs of a coming eclipse, which will occur when it is below the horizon in Queensland. The darkened part of the Moon's face will be more extensive in the west than in Brisbane.

As Jupiter will apparently be passing very close to Neptune on the 18th, observers will find it interesting to look for these planets in the evening with their telescopes, before the Moon rises, about this time of the month. The planets will rise about one hour before the Sun.

On the 23rd the Sun will reach the junction between the ecliptic and the celestial equator, and the Australian vernal equinox will occur.

After the Moon has risen on the morning of the 25th the nearness of the planet Mars will be noticeable, a conjunction having occurred about an hour before rising, when they were about 2 degrees apart.

A conjunction between the Moon and Venus will occur a day later, 26th, at 4 a.m., when they will be 4 degrees apart.

Mercury rises at 5.13 a.m. on 1st September.

Venus rises at 3.27 a.m. on the 1st and at 3·26 a.m. on the 15th.

Mars rises at 3.19 a.m. on the 1st and at 3·0 a.m. on the 15th.

Jupiter rises only 9 minutes before the Sun on the 1st and 38 minutes before t on the 15th.

Saturn rises at 2·30 p.m. and sets at 4·6 a.m. on the 1st; on the 15th it will rise at 1·33 p.m. and set at 3·7 a.m.

The Southern Cross will be at its most western position III. at 8 o'clock on the 1st, and at VI. on the 30th to observers near the 150th meridian.

7 Oct.	☾	First Quarter	6 5	a.m.
14 ,,	○	Full Moon	11 18	p.m.
23 ,,	☽	Last Quarter	3 14	a.m.
30 ,,	●	New Moon	12 56	a.m.

Perigee, 2nd October, at 3.18 a.m.
Apogee, 17th October, at 4.6 p.m.
Perigee, 31st October, at 12.18 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Dairy Production—New Legislation.

MAINTENANCE of high standards in dairy production has material advantages obvious to everyone engaged in the industry, and a more effective stabilisation of those standards is one of the chief aims of the Dairy Produce Act Amendment Bill now before Parliament. A notable second-reading speech was made on the measure by the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, in the course of which he said that Queensland is the pre-eminent State in respect of butter production. Our average weekly factory output is 16 tons. For the other States the average weekly factory figures in tons are:—New South Wales, 10.6; Victoria, 8; South Australia, Western Australia, and Tasmania, about 4 tons each. It is plain that a consideration of the whole of the facts shows the necessity for maintaining a standard that will be acceptable to the people overseas, for taking full advantage of knowledge gained and efficiency attained, and for consolidating our present position in preparation for still further progress in the industry. The history of the industry in Queensland reveals a remarkable record of expansion in recent years. In 1904, when the original controlling legislation was passed, the butter output in the State was 17,000,000 lb., and that of cheese 2,600,000 lb. In 1931, the weight of butter manufactured was 97,500,000 lb., and that of cheese 12,250,000 lb. Not only has production increased so largely, but quality has improved to an extent that Queensland now enjoys a reputation for its butter second to none on the world's market.

Butter Factory Payments.

ONLY two new principles are embodied in the amending Bill, neither affecting the operation of the principal Act, and they were explained fully by Mr. Bulcock. The first is to ensure that all factories shall pay for their raw material in the same manner, but not necessarily at the same figure. By the application of this principle producers will be able to know whether one factory is paying a higher price than another factory for the same quality and grade of cream that they may be producing. The necessity for this amendment comes about by

virtue of the fact that the associations which were established on a co-operative basis years ago, and which were accepted as co-operative undertakings, have very largely lost their identity as co-operative undertakings and have become competitive corporations, the one in competition with the other. In other words, the practice in respect of methods of payment has very materially undermined that very essential principle—the maintenance of the true co-operative spirit. What is happening at the present time is that, in an endeavour to encourage cream to come to them and by a system of bookkeeping, some factories are trying to stimulate the desire on the part of individuals to send their cream to those particular factories; because, owing to there being no sound and satisfactory method of bookkeeping, those individuals are apt to believe that one factory gives an advantage over another. It is true that, in the aggregate, over the whole twelve months there may not be any very great variation as between factories; but from month to month there are often very considerable variations. It is established that in practice certain factories pay more for winter cream than the other factories, and they equate their books by paying slightly lower amounts for cream when it is more plentiful. The result is that there is no very great variation on the whole; but the practice tends to undermine the co-operative spirit, and makes the producers themselves discontented.

The new measure will determine the ability of the factories to pay, and will give a fair reflex of the position of all factories to enable comparisons to be made. There is undoubtedly in the industry a desire that some sound and satisfactory basis of comparison should exist. We hear the statement made by all the leaders of the dairying industry in Queensland—and they urge it very fully and forcibly—that there is a real necessity for a system of bookkeeping which will allow of comparisons between one factory and another being made by the ordinary farmer. There is no suggestion that there is malpractice in bookkeeping. Our system does not permit of that, and obviously no reputable dairy directorate would embark on dubious practices; but there is this variation of price caused by a variation in bookkeeping methods, which causes discontent.

The existing Act provides that cream supplied to a factory shall, according to the grade of such cream, be paid for as follows:—(*a*) On the basis of the butter fat results, estimated in manner prescribed by regulations; or (*b*) on the amount of butter obtainable from such cream, estimated in manner prescribed by regulation. All butter factories in Queensland pay on the quantity of butter obtainable from cream. Manufacturers' butter-computing tables are used. If there were a uniform system of bookkeeping, the cream producer would undoubtedly have that basis of comparison which he desires. There is a real desire on the part of the supplier to have that basis, so that he may accurately estimate the relative merits of the factories operating within the territory in which he is producing. The passage of this Bill will very largely dispel the discontent which is very evident at present, and will have the additional advantage in the eyes of those who subscribe to the co-operative principle that it will formulate a system whereby a true basis of co-operation will be achieved, and not a basis of antagonism and competition. A uniform system of bookkeeping will do more to achieve that very desirable object than possibly any other single thing that could be suggested. The Bill, therefore, gives power to make regulations to compel factories to keep their books uniformly. To-day every factory has its own system of bookkeeping and its own financial year. It is obvious that sound bases for comparison do not exist. If the financial year of one factory terminates at one period, and another at another period, tedious calculations from the two sets of books are necessary in order to arrive at a clear understanding at just what one factory is doing in comparison with others. A uniform system of bookkeeping with the year terminating at a given period will supply a basis of comparison over the same periods. It is hoped that the objective that will be attained by the passage of this legislation will be to stimulate a better return, to provide for increased efficiency and economy, and that it will not be the means of misleading prices being arrived at by bookkeeping methods.

There is, perhaps, some misconception in relation to the intention of the Bill in this respect. It has been held that it will discourage the factories from paying high prices, but there is no such intention. The reverse is rather the case, because the Bill aims at promoting efficiency within the industry. If any factory feels that it is in a position to pay high prices, it will undoubtedly continue to pay those prices.

Cream Supplies—Wasteful Competition Prohibited.

THE second new principle, as explained by Mr. Bulcock, is the prohibition of the payment of freight on cream by the butter factories—a principle favoured by the general concensus of dairying opinion. There can be no doubt that the payment of subsidies on cream is a practice that is rapidly expanding. The average co-operative dairy association does not desire to pay these subsidies, but, because a neighbouring factory pays them, they are all being dragged into the system willy-nilly. The consequence is that cream is conveyed long distances on account of encouragement extended to the producer by certain factories at the expense of other producers. Cream is a perishable commodity. We desire to maintain the high quality standard our butter has attained, and every box of inferior grade butter that is produced is an affront to our endeavour to maintain that high quality standard. There is no reason why, with adequate supervision in the production of cream on the farm and its processing in the factories, with the added and improved means of transport, we should not continue to produce the best quality butter that the State is capable of producing.

A system which allows of the production of butter below the best quality is a system which calls for the closest examination. On examination, we find that one of the reasons is the distance over which cream must be carried before it is processed. As a State we cannot afford, more particularly in a major industry like the dairying industry, to neglect the economic equations. If we neglect them, and continue to produce butter that is not of the highest quality that can be produced from a given quantity of cream, we are definitely wanting in the promotion of that economic efficiency at which we should all aim.

The major point in association with this factor in the Bill is that provision is made that factories are not to defray the whole or any part of the cost of transport of cream to a factory. This does not mean that a supplier will not be able to send his cream to any factory to which he desires to send it. There has been an argument that we should zone the whole of Queensland into dairying districts, and that we should compel all producers in a given zone to send their cream to the factory or factories within that zone. That is a scheme that has been largely moving the minds of people in the dairying industry for a considerable time, and perhaps it would be the ideal thing were it possible of consummation. It is not at present argued that zoning is the real solution of the difficulty; but the amending measure is definitely a step in the direction of zoning when taken in association with a uniform system of bookkeeping. If it does not accomplish a full zoning, it will lead very forcibly to a recognition and realisation of the merits of zoning in the future. Possibly that will be all to the good of the industry concerned.

The audit of factory accounts by the departmental inspector is to be extended to the financial transactions of factories and agents, if deemed necessary. At present the inspector checks the manufacture and disbursements to suppliers, ensuring that the overrun has been distributed.

It is not claimed that the Bill fulfils all the necessities of the dairying industry, but it does very definitely represent another stage along the road that will bring us to the goal of maximum dairying efficiency.

Districts to which the legislation will apply are the Maranoa and Darling Downs, all along the coast from the New South Wales border to Rockhampton, including Moreton, Wide Bay, Burnett, and Port Curtis; the Atherton Tableland, and districts immediately surrounding Charters Towers, as well as the coastal belt between Mackay and Cairns. Considering the territory that is embraced by the administration of this legislation, the relatively small cost that is incurred, the very beneficial results that accrued to the dairying industry by the existing statute, and the material benefits that will be given by the legislative enactment proposed, it will be agreed generally that the dairying industry is being placed on that sound and firm foundation that is necessary in respect of the producer so far as factory management is concerned, and, last but certainly not least, the interests of the consumer.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

Part XXX.

Sugar Experiment Stations in Queensland.

SUGAR Experiment Stations are a comparatively recent development in the sugar industry of the world, and Queensland was not very far behind some of the earliest and was much in advance of others.

The first Sugar Experiment Stations created were those of Java and Louisiana in the year 1885.

That of Java was known as Midden-Java or Central Java, at Semerang; a year later the Experiment Station known as West Java was founded at Kagok, and the next year that of East Java at Pasoeroean. These were then run by separate independent planters' associations. They were, however, finally merged in the Pasoeroean Experiment or Proef Station of East Java.

The Sugar Experiment Station of Louisiana was situated at Audubon Park, New Orleans.

The next important Sugar Experiment Station to be established was that of Hawaii in 1895.

Queensland commenced with a Sugar Cane Laboratory in 1898, cane being also experimented with on the old State Nursery at Mackay which had then been in existence for some years. It was not, however, till November, 1900, that the Bureau of Sugar Experiment Stations began operations under its first Director, Dr. Walter Maxwell, who retired from the Queensland service in 1909, and died in July, 1931.

Other cane Experiment Stations were established in different parts of the world as follows:—

Station.	Year of Founding.
St. Kitts	1899
Argentine	1907
Porto Rico	1910
Trinidad, St. Augustine	1911
Cuba	1925
Peru	1927
Natal, South Africa	1927
Mauritius Sugar-cane Research Station	1930

The Queensland Sugar Stations.

The establishment of Sugar Experiment Stations in Queensland was advocated for many years before they were actually initiated.

When the Royal Commission on the Sugar Industry sat in 1888-1889, several witnesses stressed the necessity for Sugar Experiment Stations, and the benefit to be derived by the industry from their foundation.

In 1888, Mr. Peter McLean (at that time Under Secretary, Department of Agriculture) was commissioned to make inquiries in connection with the North Eton Central Mill at Mackay, and he was at the same time requested to make inquiries as to the establishment of experimental farms or test stations. In addition to sugar, it was stated by the

Minister that he was convinced there were many valuable products connected with tropical and semi-tropical agriculture which could be profitably introduced into Queensland, such as tea, coffee, cocoa, india rubber, vanilla, pepper, nutmeg, spices of all descriptions, rice, and fibre plants.

On his return Mr. McLean submitted a report in which he said:—

> "I have carefully considered the question of experiment farms or test stations, and have come to the conclusion that what is wanted at present are State Nurseries—one at Mackay and the other at Cairns. There is Crown land available at each place. Within 3 miles of the town of Mackay there is a reserve of 142 acres for recreation purposes, known as 'The Lagoons,' the land is all cleared, the soil good and suitable for the purpose, and a plentiful supply of water, and a nursery could be worked there at a comparatively small cost. It would be centrally situated and accessible to planters and farmers from all the surrounding districts.
>
> "At Cairns, there is a Government reserve about 8 miles from the town, near to the Barron River, and contiguous to the village of Kamerunga."

Accordingly, a State Nursery was established at Mackay on "The Lagoons," the Crown land mentioned in Mr. McLean's report. The area selected for the nursery amounted to 52 acres, and this afterwards became the site for the first Sugar Experiment Station in Queensland.

No chemical work was undertaken at this State Nursery, but sugar-cane, amongst other tropical plants, was experimented with, and reports were issued as to the behaviour in the field of the varieties of cane then undergoing trial. It was to the Mackay and Kamerunga State Nurseries that the New Guinea canes introduced by Messrs. Cowley and Henry Tryon were first brought. Experiments with fertilizers were also carried out at Mackay, but these appear to have been considerably criticised. In an editorial in the August number of the "Mackay Sugar Journal," however, it was admitted that, as leading up to proper Experiment Stations, the two State Nurseries were undoubtedly a step in the right direction.

Such diverse crops as oranges, mulberries, coffee, tea, rubber, Japanese plums, grape vines, mangoes, plantains, peaches, arrowroot, mangold wurzels, wheat, oats, rye, grasses, sisal hemp, rice, candle nuts, and sugar-cane were grown.

In sending out parcels of sugar-cane for trial on the surrounding plantations the overseer remarked in 1893 that the mill chemists would be able to determine the amount of sugar in the varieties, but, that as far as "tasting" went, a seedling cane he had received from Kew and had called "Kewensis," was the sweetest that had come under his notice.

In 1893, six varieties of cane (Cowley's collection), and subsequently in 1896, Tryon's collection, were planted at Mackay and Kamerunga.

In 1894 the lack of scientific control was much lamented. No analyses of sugar-canes were made, and it was said that, however conscientious the overseers might be, the nurseries, which were nurseries and nothing more, might be the means of propagating and distributing

PLATE 128.—OLD STATE NURSERY, MACKAY.

disease, for the overseers could not be expected to detect all diseases without scientific help. The Government knew that Queensland sugar was then entering into competition with the world, and if it were to succeed must compete on equal terms. Every sugar country of importance had a Sugar Experiment Station, and many of these places had a world-wide reputation. Queensland stood alone in urging people to enter upon tropical agriculture, and then withholding the ordinary assistance which was necessary to success. Many sugar growers had to send samples of their soils to London to be analysed.

In 1895, an agitation for agricultural stations and a tropical experimental farm and laboratory was commenced. It was pointed out that the most important work in tropical agriculture was connected with sugar-cane. Mr. Tryon, the Government Entomologist and Pathologist at that time, set out in a report the objects of a Sugar Experiment Farm which, in addition to testing the qualities of sugar-cane under cultivation, included a laboratory for analyses of soils, manures, mill products, &c., and suggested that a Sugar Experiment Station should be erected and equipped by the Government in the first instance and afterwards maintained partly by contributions from the general revenue and partly by assessment of the cane growers on the basis of acreage under cane.

During 1897 and 1898 the subject was not lost sight of, and articles advocating the foundation of Sugar Experiment Stations continued to appear in the "Sugar Journal," and J. C. Brünnich was also a warm supporter of the idea, and in a report to the Government said that for the benefit of such an important branch of agriculture as sugar an Experiment Station should be established by the Government, and suggested it should consist of a central station with sub-stations at Wide Bay, Mackay, and Cardwell, the latter place including the Lower Burdekin, Herbert and Johnstone Rivers, and Cairns. He considered the chief station should be at Bundaberg.

At length in 1898 the "Sugar Journal" was able to announce that at last they were getting nearer to the establishment in the colony of a Sugar Experiment Station, and that the Minister for Agriculture had told a Mackay meeting that he proposed to take steps at an early date to add a laboratory to the State Nursery, and to initiate a series of experiments. He pointed out that only a small commencement could be made at first.

Later in 1898, the laboratory was erected on part of the site of the Mackay Nursery on "The Lagoons." Mr. J. C. Brünnich, late chemist to the Department of Agriculture, laid out this laboratory, which was a very convenient building (shown below) and which was well fitted for the work then required. Mr. A. A. Ramsay, now Chemist to the Department of Agriculture in New South Wales, was appointed chemist in charge (in which position he remained till the Bureau of Sugar Experiment Stations was created in 1900), and took over the whole of the State Nursery and the Laboratory.

The industry did not remain long satisfied with the State Nursery plus Laboratory idea, and in 1899 it was announced that the State Nursery would be done away with and the site be used on a more satisfactory basis as a Sugar Experiment Station. The fruit and other trees and crops were mostly grubbed out. In the meantime efforts were being

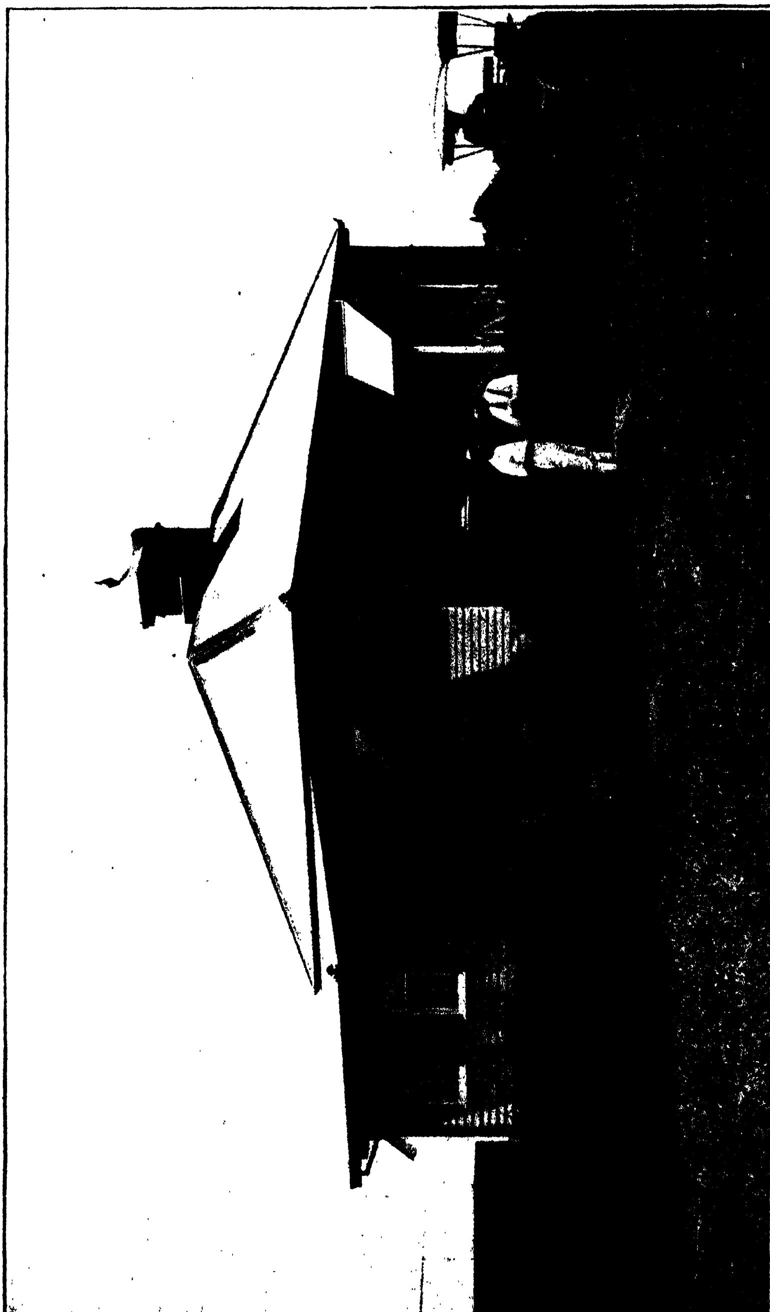

PLATE 129.—THE SUGAR CANE LABORATORY AT MACKAY ERECTED IN 1898.

made by the sugar growers to induce the Government to procure the services of Dr. Walter Maxwell, at that time Director of the Hawaiian Sugar Experiment Station, to visit Queensland and advise on the industry generally; the Bundaberg Planters and Farmers' Association taking the initial steps.

Later, the Minister for Agriculture, the late Mr. J. V. Chataway, who was interested in the "Mercury" newspaper of Mackay, and the "Sugar Journal and Tropical Cultivator," also published at Mackay, announced that Dr. Maxwell was about to visit Queensland for the purpose of making a report upon the sugar-growing industry. A short while after Dr. Maxwell arrived in Queensland, and was generally acclaimed as a possible saviour of the industry, and it was predicted that his visit should prove a turning point in the history of the cane industry.

Dr. Maxwell's report has already been quoted in this History, but his remarks as to Sugar Experiment Stations, were as follows:—

"It is advised that the several sections of cane growers and manufactureres, as represented at present by local associations in the respective districts, shall unite themselves into one body, which shall be known as 'The Sugar Growers and Manufacturers' Association of Queensland.' A chief function of the association which shall be established upon a basis such as, or similar to, what is suggested, shall be to introduce modern scientific methods in the growing of cane, and to still further improve the modes of manufacture. The lines upon which these agricultural and technical reforms shall be instituted and carried out are hereby set forth in detail:—

"Three experiment stations shall be established—one to represent the Cairns district, and to be located at Mulgrave, in the neighbourhood of the Mulgrave Central Mill; one at Mackay, which shall meet the needs of that district; and one in the vicinity of Bundaberg, which shall represent the Bundaberg and Isis district. The one at Bundaberg shall be the chief experiment station and headquarters of the Director and of the main laboratory and chemical staff.

"A director shall be appointed who shall establish the said stations, appoint and locate an assistant director upon each station, and engage chemists for all laboratory requirements.

"The functions of the director, after the establishment of the said stations, shall be as follows:—

(1) To personally visit all districts and sub-districts where cane is grown, and to inspect the farms and plantations of the growers; advising in all matters of the field, such as selection of lands suitable, and leaving out of lands unsuitable, for cane; the individual acts of cultivation, the resting and rotating of the soils with other crops, the introduction of other economic crops and sources of profit; and the instituting of new means for the restoring and maintaining of the producing power of the lands.

(2) To examine the soils in the field, and take samples for analysis in laboratories, and to advise manures according to the ascertained requirements of each soil and location.

(3) To inspect the mills during the crushing season, advising and aiding the manager in the several acts of the manufacture.

(4) To institute experiments at each of the three stations along the several lines of cultivation, planting, manuring, irrigating, and study of cane varieties; and likewise to study prevailing diseases and pests.

(5) To advise and aid the canegrowers and manufacturers on questions of sale and purchase of cane, and to be at the service of the association in its affairs which are connected with the State.

(6) To train and prepare the assistant directors, in order that they shall ultimately become fitted for the responsible direction of the respective stations. The term of requirement of the services of the director in chief should not exceed five years.

"To embody and execute the functions as set forth, it is seen that the director must, of necessity, be a thorough agriculturist, a highly trained scientist, and conversant with all questions of the field and mill. His practical experience and technical knowledge must be such as to secure the absolute confidence of the canegrowers and the mill officials, whilst his tact and business capacity must be to hand in all practical situations.

"The selection of the director will be the most important act of the association. His fitness for the position must be absolutely certain; then he must be given full responsibility and discretion. And his responsibilities will be varied and heavy; for he must not only talk with and advise the farmers in the fields and the managers in the mills, but he must appoint the work of the chemists in the analysis of soils, and control inspections of manures and know that they are accurately carried out; and he must advise the composition of the manures to be used, and know where the manures can be most economically obtained. In brief, the absolute direction of the experimental work that we are advising will be his hands, and its success will rest wholly with him. He, therefore, must be a man of the fullest and most unquestioned fitness for the position. Unless such a man is found and entrusted with the work, we cannot accept the responsibility for the adoption of the remainder of our recommendations.

"With the institution of such a system of scientific and practical experimentation as we have set forth, the direct advising and instructing of the growers and manufacturers along new and tried lines would begin. Upon these would follow the accurately ascertained results of the experiments at the stations, which results would serve as guides and as actual examples, showing what could be done on a larger scale. By these means would be set in movement the influence of new ideas and the knowledge of new methods and their results, until gradually, but surely, a new system and order of things will have taken root in the whole field of sugar production throughout the colony.

"Now appears to be the time to put this new work into operation. We have seen the lands and conditions of the sugar-growing areas, and are fully persuaded of their native capability

to produce; but we have also noticed the exhausted state of the soils and their demand for restoration and help. A decision of some kind cannot be evaded. If it is not determined to at once begin the new and advised order of things, then it is decided to let matters be as they are, or go from what they are to worse, until the opportunity is worn out. We most urgently advise that work shall begin at once, for great possibilities yet stand before the sugar industry of the colony."

After perusal of the above recommendations it was naturally felt that there could be only one man for the position of Director—viz., Dr. Maxwell himself, if he would accept—and the Cabinet, owing to representations from the various sugar districts, decided in March, 1900, to write to Dr. Maxwell asking him to transfer his services to Queensland.

It should be pointed out that the Hawaiian Sugar Experiment Station had been very successful, and that Dr. Maxwell, as the Director, had a high reputation and was credited with having helped to regenerate the industry in Hawaii.

A Sugar Conference was held at Mackay in March, 1900, at which most of the sugar districts were represented, and it approved of Dr. Maxwell's recommendations that Sugar Experiment Stations should be established, and further, that the moneys raised for the purpose should be endowed pound for pound by the Government. The eagerness shown to obtain Dr. Maxwell's services contrasted oddly enough with the vials of wrath that were subsequently poured over his head by the very people who had been so warm to secure his services. However, he accepted the appointment of Director, and "*The Sugar Experiment Stations Act of 1900*" was assented to on the 14th December, 1900.

This Act was to provide for the establishment and control of Sugar Experiment Stations, the appointment of a Director, and created a "Sugar Fund." So many Sugar Experiment Stations were to be established and maintained as the Minister thought necessary, and these could be provided and equipped with all buildings, laboratories, machinery, instruments and apparatus, and all other matters and things necessary or proper for the conducting of experiments in connection with sugar-cane and sugar, and the by-products thereof, and for preventing the spread of disease in cane.

The Director was to have the general direction, care, and control of all such Experiment Stations, appoint inspectors and officers, and make or cause to be made such inquiries, researches, and investigations as he thought fit.

The "Sugar Fund" was to be provided as follows:—

"The Minister might in each year make and levy an assessment not exceeding one penny on every ton of sugar-cane received at a sugar works (i.e., any mill) for the extraction of sugar-cane juice. Such assessment was to be paid to the Minister in the first instance by the owner of every sugar works upon the actual number of tons of sugar-cane received during the season with respect to which notice of assessment had been given; but such assessment was to be paid and borne by the owner of the sugar works and the grower of the cane respectively, in equal proportions, and the owner of the sugar works would be entitled to deduct the amount of such assessment from any moneys due by him to the grower.

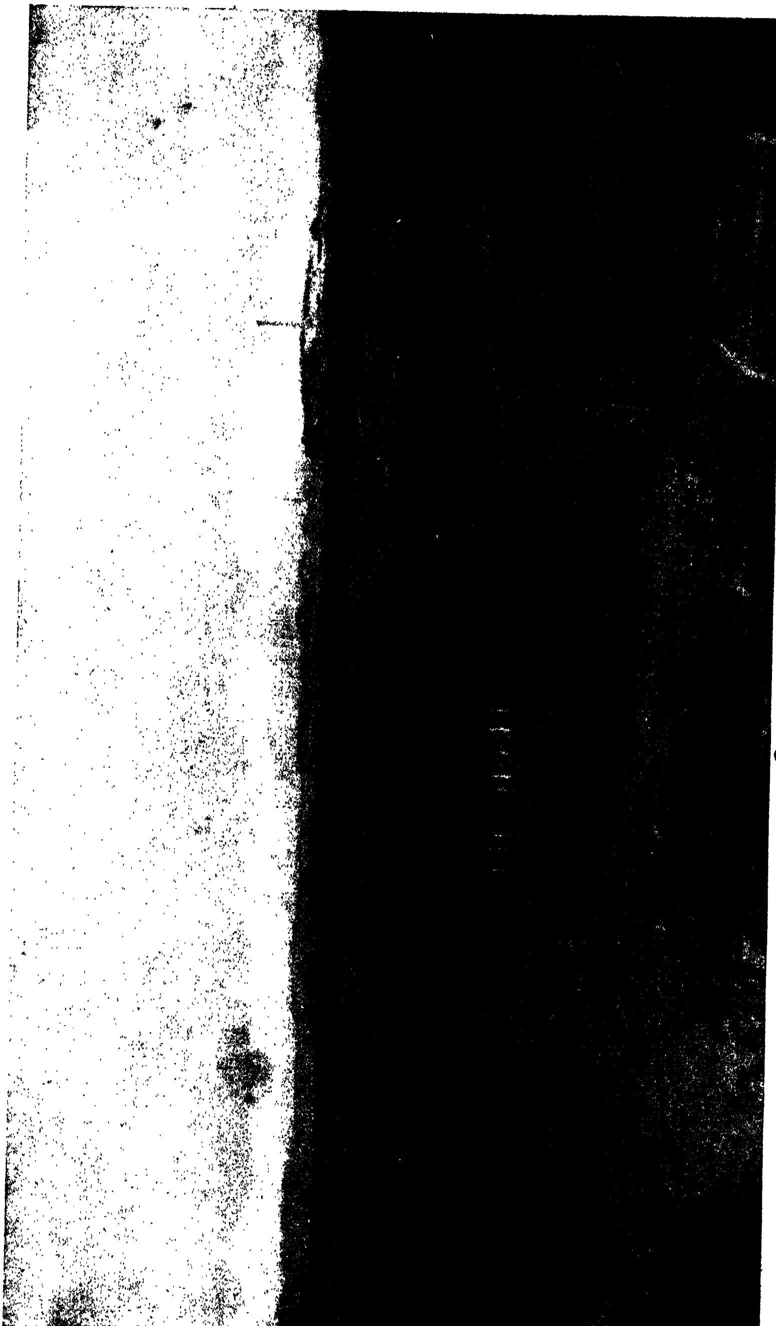

Plate 130.—On the Sugar Experiment Station at Mackay. Old Sugar Mills in the Distance.

> "In every year there was to be paid by the Treasurer into the Fund from the Consolidated Revenue a sum equal to the amount of assessments levied in each year.
>
> "Provision was also made for the Director to make an annual report."

Operations were commenced forthwith, and in the Director's first report he stated that in Mackay an Experiment Station, with laboratory attached, was already in existence, and it was decided to make an immediate and full use of that station until other laboratories determined upon could be built and put into operation. The next step was to build a central laboratory in Bundaberg, where it was intended that the whole work of the chemical and other investigations should be carried on. In August, 1901, this Central Laboratory was ready, and chemical work began on 1st September, being chiefly devoted to soil analyses and examinations. The first chemists engaged were Messrs. Firman Thompson (First Assistant Chemist) and Dr. A. J. Gibson, G. R. Patten, C. H. O'Brien, and A. E. Anderssen. Messrs Gibson and Patten were subsequently First Assistant Chemists at the Bundaberg Laboratory. Mr. A. Henry, now Secretary to the Cane Prices Board, was the Secretary to the Bureau at that time, and the writer was the Assistant Director in charge of the Mackay Sugar Experiment Station.

In addition to the establishment of laboratories, the general plans of the Bureau included the establishment of field experimental work, comprising experiments with manures and different methods of cultivation. In view of prospective Commonwealth legislation pending at that period it was not considered wise to push on with the establishment of other Experiment Stations outside Mackay, so the Director decided to lay out a series of experimental fields on a small scale.

The main purpose and work of the Mackay Station was to be experimentation along the lines of sugar production, and to include cultivation, manuring, irrigation, and the introduction and determination of the value of different varieties of cane, and a selection of special varieties for special localities in respect of the nature of the soil and climatic conditions of such localities.

The first experiments carried out at Mackay were with the collection of canes brought over from New Guinea by Mr. Tryon, supplemented by a few older kinds introduced at an earlier date by Mr. Cowley.

Experimental work at Mackay subsequently included the thorough testing of all the New Guinea canes from a commercial and chemical point of view, and the ultimate selection of the best of these for distribution to the industry, and these afterwards became the standard canes of the Northern districts for many years, though they were not so much favoured in Southern Queensland owing to the fact that the variety known as D. 1135, or "Fairymead," was found to give good results in those localities. A large number of experiments in cultivation, subsoiling, fertilization, irrigation, and general husbandry of the sugar-cane plant were carried out, and the best varieties from other countries were imported and thoroughly tried out. Lectures to farmers throughout the Queensland sugar districts, by the Director and Assistant Director were also given, and some help was afford to sugar mills by travelling chemists.

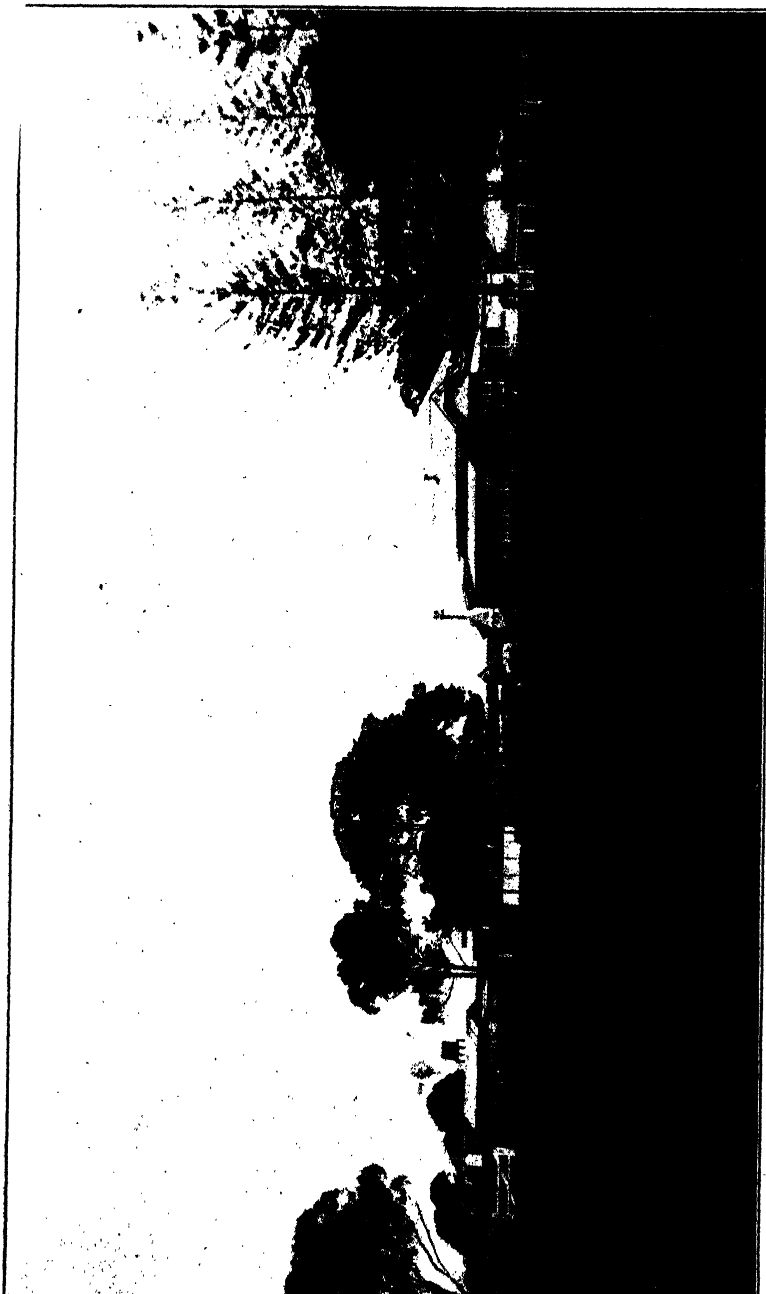

PLATE 131.—SUGAR EXPERIMENT STATION, BUNDABERG.

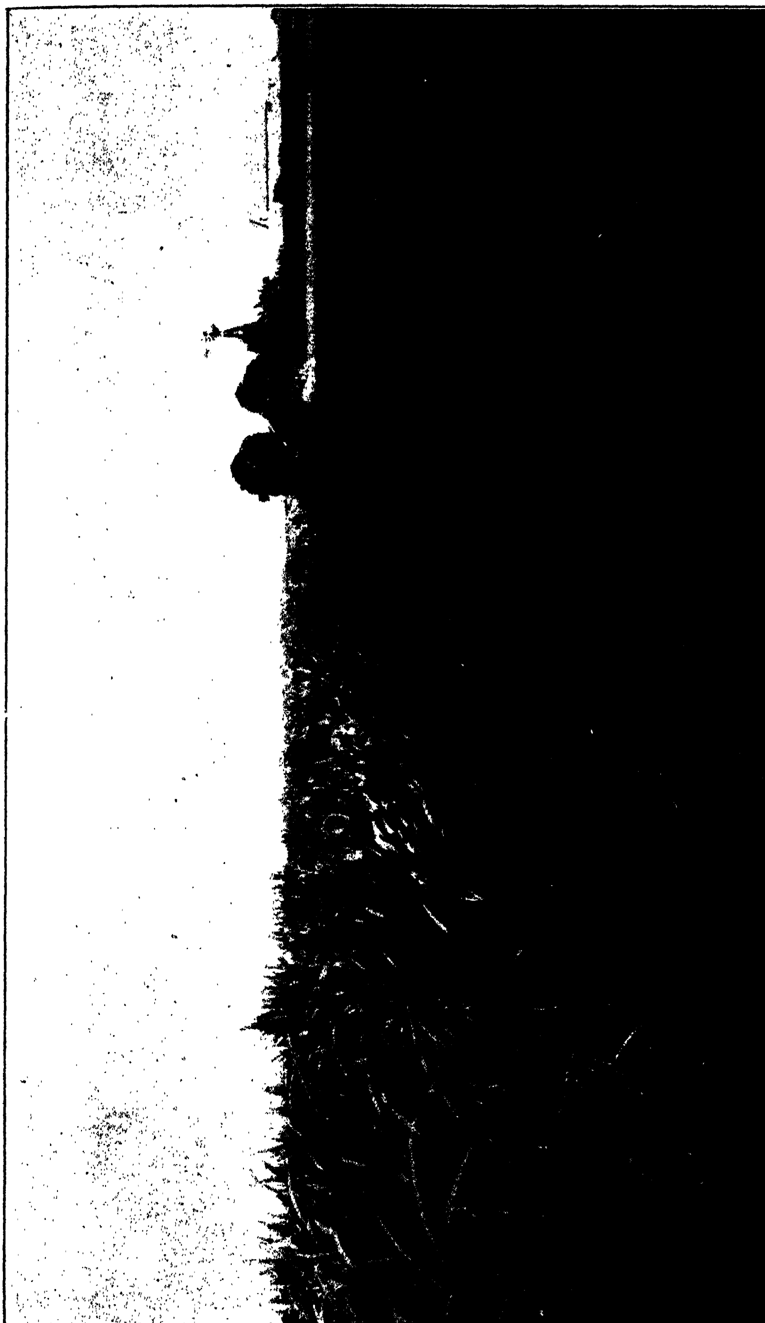

Plate 132.—Cultivation at Sugar Experiment Station, Bundaberg.

It is not intended to burden this history with the results of the great amount of experiment work that was carried out at the Mackay Station. These will be found set out in the various Annual Reports of the Bureau, and in a more convenient form in Bulletin No. 4 of the Sugar Bureau.

During Dr. Maxwell's term as Director, no further efforts were made to extend the Experiment Stations to the south and north of Mackay, nor was anything done in connection with the matter of insect pests and diseases of cane.

A large number of soil analyses were made at the Laboratory at Bundaberg between 1901 and 1909, also of fertilizers, irrigation waters, and mill products.

The first Director retired in 1909, and in 1910 the Bundaberg Laboratory was closed, the analytical work being transferred to Brisbane and Mackay.

A new series of experimental field trials was established in both North and South Queensland in the year 1911, and in that year the first attempt to deal with the insect pests of sugar-cane was made by the appointment of an entomologist to take up this line of investigation, while a little later an assistant to the entomologist was appointed. Field assistants were also provided, to visit farmers, and where necessary give instructions on cane cultivation. During this year too, another expedition was sent to New Guinea to procure new varieties of cane for trial. A commencement was also made in the issue of Bulletins relating to the problems of the industry.

At the end of the following year, 1913, the second Sugar Experiment Station, that of Bundaberg, was instituted. The site selected was at Kalkie, about 3½ miles from the city of Bundaberg, but conveniently situated. It was an existing farm of average-quality land. The farm contained 45 acres, practically all red soil. Experimental work on this farm commenced in 1914, and a laboratory for sugar-cane work was established. Thus two of the original Sugar Experiment Stations planned were then in existence.

In 1914, the Entomologist engaged in America decided to return there, and steps were taken to engage another man from abroad. In the meantime the officer who is now in charge of the Entomological Station in the North, Mr. Edmund Jarvis, took charge as Acting Entomologist. In 1917, the entomological work was transferred from Gordonvale to Meringa, where new buildings, comprising a laboratory and residences, had been erected, and Dr. Illingworth, formerly a Professor of Entomology at the College of Hawaii, was engaged for a term of four years, and took charge with Mr. Jarvis as assistant.

This year, 1917, it was also determined to complete the chain of Experiment Stations by the creation of a Northern one at South Johnstone, near Innisfail. The piece of land chosen as a site for this station was upon the opposite side of the South Johnstone River from the South Johnstone Mill. The land was Crown land, portion of a reserve, and contained 92 acres in all. The necessary buildings, comprising a residence for the Chemist in Charge, a very complete laboratory for sugar soils, and other general work, and foreman's residence, men's quarters, and stables, were erected in 1918. The station land is situate at the foot of the Basilisk Range, and contains land of only average quality, low

Plate 133.—The Sugar Experiment Station at South Johnstone.

in available phosphoric acid and lime. Much of this area had previously been under lease for banana growing. There were numbers of old stumps present, but otherwise the land had been fairly well cleared, and ere long it was fenced in and prepared for experiment work, which commenced in 1919.

The need for a Northern Station had been greatly felt, as one of the most important objects—that of the propagation of cane from seed—had been found impossible at Mackay or Bundaberg. Numerous trials had been made at the Mackay Station for many years, but due to the fact that the cane did not arrow freely on that station and that many varieties did not produce mature flowers, no fertile seed was ever procured—it being a necessity for cross-fertilization work that all varieties should arrow together. With the favourable environment in North Queensland the raising of cane from seed is a comparatively easy matter, and this work was commenced in 1921. Seedling propagation is now the principal work of the South Johnstone Station, which also supplies seed for similar work at Mackay and Bundaberg Stations.

By the opening of the South Johnstone Station the original plan of three Experiment Stations—one for the Southern, one for the Central, and one for the Northern areas—was fulfilled.

In the next article it is proposed to deal with the placing of the Sugar Experiment Station work on a more modern and scientific basis.

[TO BE CONCLUDED.]

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

THE TOBACCO STEM BORER.

By J. HAROLD SMITH, M.Sc., Entomological Branch.

LAST year, 1931, inquiries from the Bowen district drew attention to the existence of the tobacco stem borer, *Phthorimæa heliopa* Low., which had not previously been officially recorded in this State as a pest of tobacco. Investigation showed the moth to be a serious menace to plants in the seed-bed, the losses in some instances, where adequate precautions had not been taken, being considerable. Even stalks remaining in the field after the leaf had been harvested were riddled throughout their length with the burrows of the larvæ. During the current year the commercial development of the industry has been rapid, and it is now practicable to assess the importance of the pest to the grower, at least in North Queensland.

There the possibilities of the crop are being exploited on a large scale at several centres, notably Mareeba and Bowen. From most of these infested material has been received, and, while reports differ as to its importance, there can be no doubt that in some districts at least, the insect may be one of the greatest obstacles to successful tobacco growing. In many instances outbreaks have occurred in areas far removed from previous cultivation. Hence it would appear that the moth is indigenous to much of the country suitable for tobacco culture, or else one must suppose that migration over considerable distances is quite a normal habit of the species. Actually, in much of the forest country concerned, it is difficult to even conjecture a probable native host plant for an insect of this type, and it is possible that both hypotheses will ultimately share in the correct account of this year's incidence of the pest.

Comparison between Stem Borer and Leaf Miner.

The tobacco stem borer, *Phthorimæa heliopa* Low., is a close ally of the tobacco leaf miner, *P. operculella* Zell., already familiar to most growers. The two moths are moulded to the same generic pattern, being alike in size and with the habit of folding their wings roofwise when at rest. In freshly emerged specimens the colour differences are distinct, heliopa having the wings suffused with a brick-brown colour which contrasts strongly with the white flecked grey typical of the better known species. When specimens of each are collected in the field, they are, however, much the same in appearance. The scales responsible for the colour have been partly shed, and with them many of the distinguishing features. Hence there is a widespread confusion between the two forms, a confusion which is accentuated by their association together in the field. Perhaps this may explain the non-recognition of the pest previously, though tobacco has been grown for many years in Australia Both species have been reared from the stems of plants which have collapsed in the field, and such losses can best be assigned to one or the other pest by the generalisation that superficial sub-surface burrowing is due to *P. operculella*, while core injury proper is caused by *P. heliopa*

Nature of Stem Borer Injury.

The injury may be considered in the two aspects which most concern the grower, the first dealing with the insect's activity in the seed-bed. Here the early indications of trouble may be seen in several of the seedlings showing tip malformation. The centre leaves do not

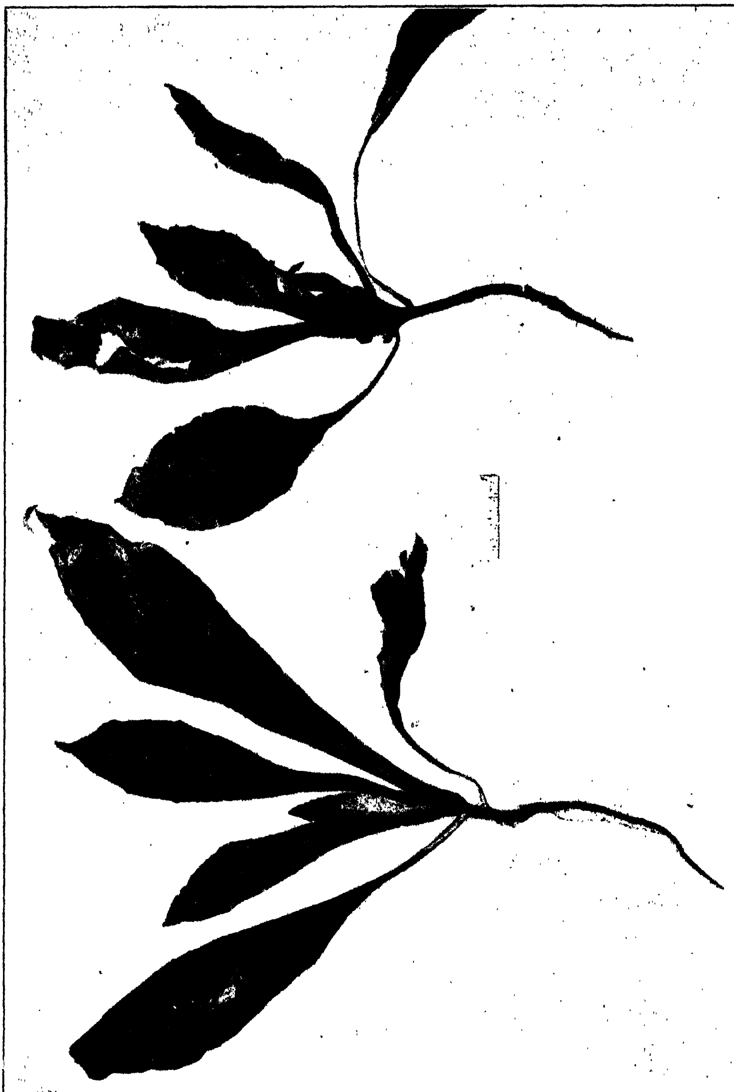

PLATE 134.

A normal tobacco seedling on the left. On the right a tobacco seedling showing the swelling at the base of the shoot caused by the presence of the tobacco stem borer.

unfurl in the usual way; they may be undersized, but more often are merely malformed as if the growth vigour of the plant was insufficient to effect its ordinary unfolding and spread. When infested seedlings are removed from the seedbed for examination their stalks will be found to be distended into galls (Plate 134), each of which harbours a single larva of the moth. These galls usually, but not necessarily, lie near the tip of the plant. The obvious interference with the ordinary development of the growing point leads to secondary suckering, the suckers being thrown from the leaf axils below the swelling in the stem. In the ordinary course of transplanting, such plants are usually discarded, but their rejection gives no guarantee that the remainder of the seedlings are free from infestation. A gall of visible dimensions is produced only when the larva within is more or less mature, hence seedlings taken from beds with only a sprinkling of galled plants may not only carry the eggs of the moth, but also young larvæ within the tissues, too small as yet to induce obvious gall formation. Such plants seldom flourish in the field. Sooner or later the main growing point is destroyed and the control of supplementary sucker growth from the lower parts of the stem compels considerable pruning at the expense of much labour. Though a crop may ultimately be harvested from such plants, it rarely has the uniformity which is considered so desirable in the field.

Attacks are, however, not limited to the seedbed, for plants may be perfectly free from the pest when set out in the field and yet succumb later on. Should the field infestation take place at an early stage, the plants react in much the same way as has been described for the seedlings. Should they be firmly established, the larvæ may develop freely within the stem without affecting the tip of the plant or causing obvious sucker growth. The mechanical disability suffered by the plants in such cases may not in itself be considerable, but too often the attack opens the way for saprophytic fungi, which may rapidly invade the healthy tissues of the stem and sooner or later induce the general collapse of the plants. Pith infestation (Plate 135) is most common in replants growing amongst an already heavily infested crop, and this suggests that resistance to new attack increases with the age of the plant. Attacks shortly after transplanting are consequently most to be feared, as they predispose the plants to general collapse, which follows the local injury caused by the larvæ and the fungal activity which it initiates.

Life History.

The life history follows more or less that of the better known tobacco leaf miner. Oval eggs, white in colour, and ornamented with reticulate surface sculpturing, are laid singly on either stem or leaf surfaces. Larvæ emerge from these in a week or so—observations are limited to the summer months—and shortly commence to burrow into the stem of the plant. Subsidiary mining of the leaves preparatory to stem boring has been recorded from other countries, and this phenomenon has also been seen here. The majority of the burrows are initiated near the axils of the leaves under the shelter of their extensions at the point of insertion to the main stalk. The nature of the burrow depends entirely on the maturity of the host, and may thus be a localised gall-like excavation, such as that described from young plants, or a wandering burrow which widens as the occupant grows. Several larvæ may be found together in the one plant. The larval period is completed in about four weeks. When full grown the larva hollows out a cavity abutting

Plate 135.
Tobacco stalks showing the nature of the attack of the tobacco stem borer in older plants.

on to the surface of the plant, an exit hole is made, and both it and the cavity are sparsely lined with silk. In this chamber pupation takes place, the adult emerging in some eight days.

In thus pupating within the stem, the tobacco stem borer differs from its close ally, the leaf miner, for the latter ordinarily leaves the host plant in the last larval stage and completes its development in the ground or, if on the plant, within the shelter of decaying leaf fragments.

Little precise information is available regarding the seasonal activity of the pest or the duration of its several stages. Apparently the female moth is capable of laying in the vicinity of one hundred eggs, these being laid irregularly over a period of three weeks. The whole life cycle occupies some six weeks, while the independent adult life is by no means brief, for adults have been kept alive without food for a month. Hence it may be safely conjectured that several generations occur in the year, these overlapping one another.

Control Measures.

With pests of this kind, control measures of any one type are not altogether satisfactory. Sprays afford no apparent relief, for the burrowing habit takes the larva beyond the reach of either stomach poisons or contact sprays very early in its life. Recourse must therefore be made to the influence of several farming practices on the pest.

Seedbed injury usually appears most significant to the grower's eye, for an epidemic phase of moth activity may ensure the wholesale destruction of his plants. As the moth is on the wing during the late afternoon, some growers have attempted to cope with them by fastening down the hessian storm covers daily about 3 p.m. The method may help, but in itself is insufficient to exclude the moths from the beds altogether should the insect population be above normal. A better method would provide for their total exclusion from the beds, if the anticipated moth infestation promises to be considerable, the advisability of the practice depending entirely on the general field losses during the previous season. Total exclusion could be effected by double covering the beds. (Plate 136). Either stockinette or a mosquito-net material would serve as a first cover, this being stayed to the sides and ends of the beds and to be regarded as permanent. In practice it would prove most convenient to fasten one side and have the other attached to a running pole which could take up an accumulated slack. Watering should be carried out through the stockinette. The usual hessian cover in general use as a protection against storm waters—so common during the later months of the year—would provide additional protection when necessary. With the dual device, plants may be raised free from lepidopterous pests up to the transplanting stage.

Cultural practices may be of material assistance in keeping the moth population down to manageable proportions. It is presumed on fairly sound grounds that the moth has few indigenous host plants in the immediate vicinity of the major tobacco districts. Hence were the infestation of the growing crop limited to adults wintering on these, the actual loss would be inconsiderable. In practice, however, laxity in the removal and destruction of volunteer plants and residual stalks remaining in the field creates a fund of additional breeding material in which the pest may continue to thrive. Growers ought therefore to uproot all

..ants in a cultivated area as soon as practicable once the leaf is ..oved in an endeavour to eliminate unnecessary breeding material. These plants have to be removed in any case before planting can be resumed in the following season, hence no additional labour is involved in the process. Ordinarily these uprooted plants will dry out rapidly if exposed to the sun and will be entirely unsuited for the further development of most of the larvæ which they contain. Those approaching maturity will shortly pupate and complete their development, but others will doubtless be destroyed. With the general adoption of such clean-up measures, the interim between the completion of harvesting and the commencement of the next season's planting should be sufficiently long to kill off the majority of the moths, in spite of their comparatively long adult life.

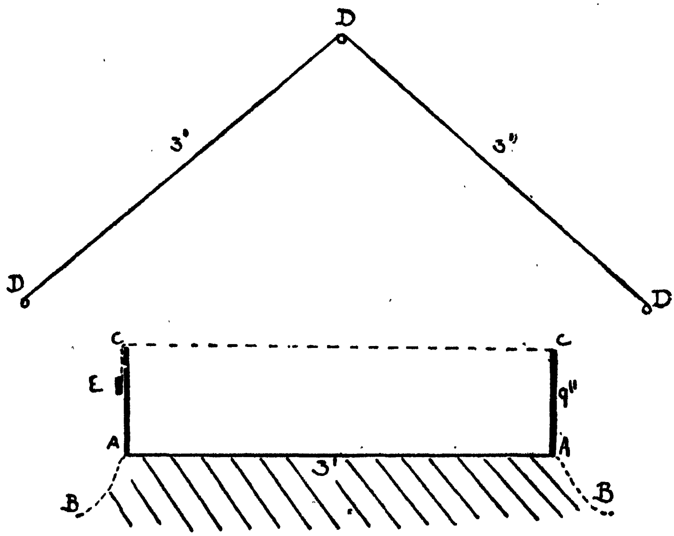

PLATE 136.

Cross section of seed-bed and approved covers for protection against the tobacco stem borer.

AA—Soil level of bed.

CA—Wooden side panels.

CC—Stockinette in position with running pole E.

DDD—Removable hessian storm cover.

Where irrigation facilities are available, growers may be tempted in frost-free districts to grow a winter crop immediately after the summer leaf is harvested. In an area free from the stem borer the venture may be quite successful, but this pest can easily upset calculations. The incidence of this and allied insects in second crops is invariably greater than that in the first—a natural consequence of rapid reproduction when the food supplies are ample. Consequently multiple cropping should only be proceeded with when the significance of the pest fauna and the practicability of its control under epidemic conditions has been thoroughly realised. It may be found later that the stem borer alone will make the practice uneconomical in the major tobacco districts.

Once plants in the field are affected, much can be done with the judicious use of the knife to ensure a crop. If the growing point is affected, the plant may be cut back to a sucker in the axil of a lower leaf, which will then function as the tip of the plant. Given subsequent freedom from heavy infestation, a crop may thus be assured, while, even if minor attacks do follow, the plants may be sufficiently hardy to grow normally. Galled tips removed from the plant in the process should in all cases be collected and destroyed.

From the foregoing discussion of control methods it will be obvious that the suggestions merely conform with the requirements of good farming, varied to meet the problem raised by the advent of, perhaps, the most serious of pests into tobacco districts. Eradication of the insect is quite impossible; control is a reasonable probability, and the latter is the goal at which growers must aim.

PLATE 137.

The Boonah troop of Australian Light Horse received congratulations at the Brisbane Show on their winning the interstate series of mounted military competitions (Forster Cup) by His Excellency the Governor-General, Sir Isaac Isaacs.

THE BOTFLIES OF THE HORSE.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

THESE notes deal with the three species of horse botflies—namely, the common botfly, *Gastrophilus intestinalis* De Geer., the throat botfly, *Gastrophilus nasalis* L., and the nose bot, *Gastrophilus hæmorrhoidalis* L.

The adults are all two-winged insects, bee-like in appearance, each species differing somewhat in colour markings, size, and habits. The common bot is a brownish-grey species with mottled wings and a white face. The female deposits her eggs on the hairs of the mane, chest, shoulders, and legs, most usually on the long hairs of the forelegs, inside and below the knee. During egg-laying the female hovers around the animal, curving the abdomen beneath the body in order to facilitate the deposition of the eggs, each of which is laid and fastened to the hair in about a second. The position of the abdomen at the time of egg-laying has given the impression that the fly stings the horse; but this is erroneous.

The throat botfly is smaller than the common bot and has a reddish thorax and a prominent black band across the abdomen. The wings are clear. The eggs are deposited by the female on the hairs under the jaws. The female fly is usually seen hovering near or between the forelegs of the horse and then quickly darting at the throat to lay her eggs. One to four eggs may be laid at the one time, each attached singly to the hairs. The presence of this fly causes the animal to nod its head violently and sometimes to strike with the forelegs.

The nose bot is the smallest of the species under discussion, and chooses the hairs of the lips for egg-laying, particularly those hairs on the edges of the lip which are moistened by the saliva. The flight of the fly is very rapid, the insect darting at the lips to deposit a single egg and then withdrawing for a few seconds to repeat the process.

As the mouth parts of the adult flies are rudimentary they cannot feed and are therefore comparatively short-lived. The common bot has been known to live as long as twenty-one days, but the average life is not thought to extend much beyond a week. The two other species live only about three to twelve days, the throat bot surviving the longer period.

LIFE HISTORY NOTES.

The Egg.

The eggs of these three botflies are glued to the hairs of the horse and differ considerably in shape, colour, and manner of attachment. The egg of the common bot is yellowish in colour and is attached to the hair for about one-third of its length, the free portion of the egg forming an angle with the hair. Frequently more than one egg may be attached to a single hair, especially if the hair is long. The eggs do not hatch until they are rubbed or licked by the horse. The minute, spiny maggots are ready to hatch in about seven days, though they may remain unhatched and alive for months.

The eggs of the throat bot are slightly different in shape to those of the common bot and are fastened to the hair for about two-thirds of their length. These eggs do not require friction to cause hatching, which takes place normally.

The eggs of the nose bot are black and stalked; the stalk being corkscrew-like and continued to the follicle from which the hair arises. Here, again, hatching does not require friction; the eggs nearest the moist edges of the lips hatch first, usually in five to six days, while those an inch away may take as long as eighteen days, and those some distance from the lips may not hatch at all.

The Larva or "Bot."

On hatching, the tiny larvæ of the common bot and nose bot are taken in by the mouth and eventually appear in the stomach, to the walls of which they adhere. In the case of the throat bot, the exact method by means of which the stomach is reached is not known for certain. As the tiny larvæ have been observed in the mucous membranes of the mouth, it seems possible that they may be able to bore their way through the skin between the jaws.

Once in the stomach, the larvæ of all three species attach themselves to the wall by means of a pair of strong mouth hooks. The common bots are reddish in colour and are found attached to the white covering of the left sac and along the ridge between the right and left sacs. The larvæ of the throat bot occur most usually near the pyloric or exit end of the stomach, and in that portion of the intestines leading out of it. Those of the nose bot may occur attached to various parts of the stomach, but are more usually located near the pyloric end. The larvæ or "bots" are all provided with rows of spines on the anterior border of the majority of the segments, the number and arrangement of the spines differing in each species. After living in the stomach for about eight to twelve months* the larvæ are fully grown and are passed out with the dung. Those of the common bot and throat bot pass out without any reattachment, but in the case of the nose bot the maggots fasten themselves to the rectum and again to the anus before they finally reach the ground.

The Pupa.

As soon as they reach the ground the maggots at once commence to seek some protection. However, they do not crawl very far, and burrow into the soil only a short distance. In one to four days the outer skin hardens and forms a protective coat, known as the puparium, inside which the transformation from the maggot or "bot" to the adult fly takes place. The puparium is brown to black in colour, but is otherwise similar to the bot. At the end of about three to ten weeks the transformation is complete and the adult fly emerges.

Injuries Caused by Botflies.

Possibly the greatest damage among horses through botfly presence is self-inflicted. Extreme annoyance and worry is caused during egg-laying by the females, as the horse recognises its enemy and makes desperate efforts to protect itself. The common bot appears the least irritating of the three species, probably because of the varied situations in which its eggs are deposited. Even so its presence keeps the animals in a continuous state of annoyance and prevents them from resting.

* The life history records are taken from "The Horse Bots and Their Control," by F. C. Bishopp and W. E. Dove, United States Department of Agriculture, Farmer's Bulletin No. 1503, 1926.

The throat bot causes the animal to throw its head about violently and makes it difficult to manage in harness. The nose botfly appears to be the most annoying species, for the insect, in depositing its eggs on the hairs of the lips, produces a severely irritating tickling. The actions of horses while the insects are about are very characteristic. The throat botfly causes them to stand together with their heads over each other's back, and if the nose fly is about they protect their lips by placing them against each other's body. Should the insects be numerous and the protections abovementioned be inadequate, the animals keep up a continuous movement, occasionally breaking into a gallop, in attempts to prevent the insects alighting and laying eggs.

It is commonly considered that the bots in the stomach are of little importance. It should be remembered, however, that the larvæ are developing for eight to twelve months in the horse's stomach, and during this period considerable harm may be done. The spiny armature and the large mouth hooks cause inflammation of those parts with which they may come into contact, which results in an interference with digestion. Very commonly many hundreds of bots may bring about obstructions and seriously interfere with the passage of food. The nature of the food taken in by bots is not known, but they certainly live at the expense of the horse, and the pinkish hue of some of the maggots indicates that they may be bloodsuckers. It has also been shown that their body fluid is decidedly toxic, and if a small quantity of this fluid is injected beneath the skin alarming symptoms result, sometimes followed by death in a very short while.

Protection and Treatment.

Various devices have been recommended for the protection of the horse against botfly attack. For the throat bot a piece of ordinary canvas attached to the nose band and tied to the headstall will completely cover

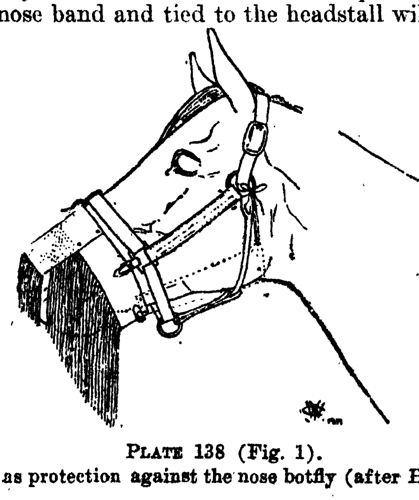

PLATE 138 (Fig. 1).
Leather nose-fringe as protection against the nose botfly (after Hadwen and Cameron).

the region between the jaws. As protection against the nose bot the Canadian authorities recommend a leather band cut into thin strips and encircling the nose (Plate 138, fig. 1). In the United States excellent results have followed the use of a mouth guard constructed from ⅞-inch hardwood boards. For protection against the throat and nose flies it


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is recommended that the throat be covered by a piece of canvas which is attached in front to the wooden mouth protector (Plate 139, fig. 2). Furthermore, this combination device is said to prevent the animal from taking into the mouth the common bots while attempting to bite or scratch itself. The hardwood guard completely protects the lips when the head is up, and the block beneath causes the guard to fall back when the head is lowered and does not interfere in any way with the animal's grazing.

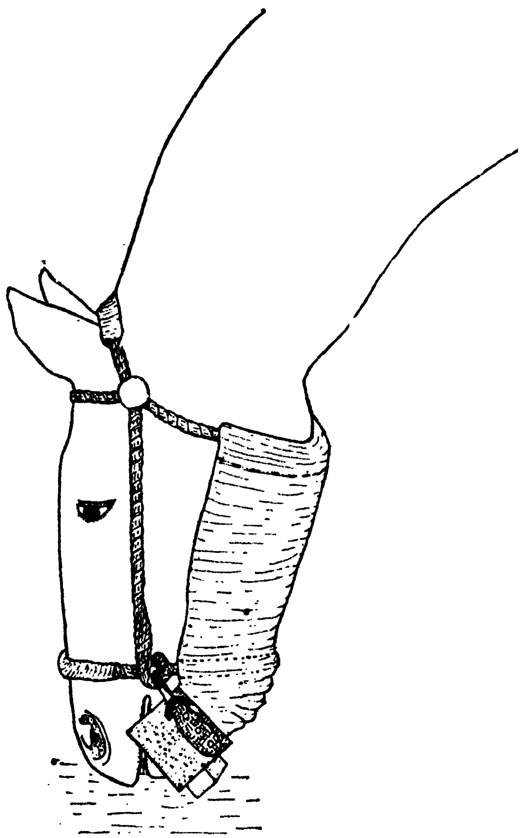

Plate 139 (Fig. 2).
Device for protection against the throat and nose botflies (after Bishopp and Dove).

Another effective protector for use against the nose botfly when the horse is in harness consists of a piece of leather 4 to 6 inches wide attached at each side to the bit ring so that the entire lips are covered.

As the eggs of the common bot are not confined to any particular region of the horse, it is difficult to discover any good means of protection. The mouth guard mentioned above (Plate 138, fig. 1) will be found beneficial. In other parts of the world the provision of deep sheds or brush shelters is said to give some protection, for when the flies are bad the animals retire into the sheds, where they are not followed to any large extent by the flies.

PLATE 140.—EGGS OF THE COMMON BOTFLY.

Frequest grooming and clipping of the hairs of the areas on which eggs are laid will aid in control, and a 2 per cent. carbolic wash applied with a rag will kill the majority of the eggs.

For the removal of the bots carbon bisulphide will be found very efficient. The animal should be fasted for eighteen hours before treatment and the drug given in a capsule, the dose rate being 6 c.cs. for every 250 lb. weight; horses of 1,000 lb. weight therefore requiring a dose of 24 c.cs. The capsule may be administered either by hand or with a balling gun. No feed or water should be given for three hours after treatment. No purgative is required either with or following the drug. If there is any question as to the animal's ability to tolerate this dose, divided doses may be given and the treatment suspended if ill effect follows the administration of a partial treatment. Great care should be taken in the administration of the capsule, for if it should break and the drug enter the lungs fatal results may follow.

It is also advisable to wash the animal thoroughly with the 2 per cent. carbolic solution before treatment to destroy any eggs, otherwise the young bots hatching from the eggs will be taken in and reinfest the stomach.

THE FARM HORSE—SOME IMPORTANT POINTS.

Discussing at a recent conference of the Agricultural Bureau of New South Wales the care and maintenance of the draught horse on the farm, and speaking more particularly of the eight or ten horse team of the average wheat farm, Mr. R. Ellis, Walla (New South Wales) drew attention to several points of importance in relation to health and efficiency.

It was pointed out that the shoulders needed the most careful attention when the horse was doing heavy and constant work. There was nothing more distressing to a driver, if he took any pride in his team, than having to work a horse with sore shoulders. Prevention was easier than cure with this complaint. Sore shoulders could be traced to several causes, of which badly-fitting harness was the most common. The collars should fit the horses properly; badly-fitting collars were the cause of many horses turning out "jibs."

The implements used on farms to-day practically all pulled from low down; that is, the draught was near the ground, causing the pull to come on the point of the shoulder. To overcome this, the collars should be stuffed full in the middle and be open at the pipe or the turn in the collar. Collars, as well as the skin of the horse, should be kept clean.

Careless drivers could ruin the shoulders of a horse in a few days if they did not keep the draught in the right place on the shoulder. Badly-shaped shoulders on horses were hard to deal with, and sometimes a breastplate had to be used instead of a collar. Clipping the shoulders was a great help, especially when the horse got a long coat in winter, and was a great preventive of sore shouders; or perhaps the horse could be clipped trace-high if he was carrying a big coat of hair. When breaking-in a young horse care should be taken during the first few days. The shoulders should be washed with cold water after work, a little salt being added to the water.

The feet should be kept in decent shape, and not allowed to grow too long. This was the cause of a lot of foot trouble with horses, and cracks, seedy toe, &c.

A stable was necessary both for the convenience of the driver and for the comfort of the horses. It was more economical to feed the team in a stable, and it was much better for the horses' health than feeding them in the open. He believed in watering before feeding, but his experience and observation proved that the horse would accommodate itself to any method in reason.

A SURVEY OF THE HELMINTH PARASITES OF THE DOMESTIC FOWL AND DOMESTIC PIGEON IN QUEENSLAND.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

THIS report is intended to record the several species of helminths collected by the writer from the domestic fowl and domestic pigeon during the past two and one-half years, together with certain observations on their prevalence and pathogenicity. The material was mainly obtained from a personal examination of 128 birds, principally from the Brisbane district, but also included several specimens forwarded from other parts of the State. Fifteen species are mentioned as being found during the course of the survey, eight of which have already been recorded by Johnston and one by Georgina Sweet. *Amœbotænia sphenoides* (*A. cuneata*), which was recorded by Johnston from the domestic fowl, has not been encountered.

Cestoda.

Davainea proglottina (Davaine 1860).

Sweet in 1910 recorded and described *Davainea varians* from Australia which appeared to differ from *D. proglottina* on certain head and rostellar characters. As these characters are extremely variable in *D. proglottina*, it is considered that the two species are probably the same. It cannot be regarded as a very prevalent parasite of the domestic fowl in Queensland, though heavy and generalised infestations in at least two flocks have been encountered. The species is regarded as extremely pathogenic in other countries and in the two outbreaks mentioned above very heavy losses were experienced. *D. proglottina* was present in 3·5 per cent. of the birds examined and was confined to about the first six inches of the intestine.

Raillietina (*Ransomia*) *tetragona* (Mol. 1858) R.Bl. 1891.

This species appears to be the commonest fowl tape-worm in Queensland, being present in 24·1 per cent. of the birds. It was generally taken from the last half of the small intestine, and was occasionally associated with nodule formation at the point of attachment. The suckers are armed with numerous rows of minute hooks, which in many specimens may be partly or entirely missing. The genital pores are unilateral and the rostellum is armed with about 90-110 hooks. The only species with which *R. tetragona* may be confused is *R. echinobothrida*, which was not encountered. In *R. echinobothrida* there are, according to Baylis, 200 rostellar hooks and the genital pores are alternating.

Raillietina sp.

This species is apparently very common among the pigeons of the Brisbane area as it has been collected on several occasions, frequently associated with a heavy infestation. The specific determination is not definite but it is thought to be *R.* (*Raillietina*) *nagpurensis* Moghe, 1925.

Raillietina (*Skrjabinia*) *cesticillus* (Mol., 1858.)

The prevalence of this tapeworm among the fowls examined was 14·6 per cent., some of the birds bearing fairly heavy infestations, one bird yielding 384 specimens. *R. cesticillus* is a moderately short species

with a rostellum armed with a double row of about 400 hooks. The suckers are unarmed. A report accompanied by specimens from the Dawson Valley indicated that this species was responsible for a heavy mortality among a flock in that locality. The species is usually to be found in the first third of the intestine and can easily be confused with *Choanotænia infundibuliformis*. This latter species, however, is recorded as possessing only a comparatively few rostellar hooks, 16-20, which are also much larger than those found in *R. cesticillus*.

Hymenolepis carioca (Magalh., 1898).

Only a few of the fowls examined, 5·8 per cent., yielded this species, which was present only in very small numbers.

Hymenolepis inermis Yoshida, 1910.

This species is a fairly common tapeworm among the fowls in the Brisbane area and several cases of gross infestation have been seen. *H. inermis* was found in the first third of the small intestine. The species is unarmed, up to about 9 mm. in length, with the cirrus sac extending practically half way across the segment. Its frequency was in the vicinity of 15 per cent. *H. inermis* is recorded from the domestic fowl for the first time from Queensland.

Nematoda.

Ascaridia lineata (Schneid., 1866).

Johnston recorded the presence of *A. galli* (*A. perspicillum*), but a careful examination has shown that the only fowl *Ascaridia* present in the material now under consideration is *A. lineata*. This nematode was present to the extent of 76·6 per cent. and was generally, when in moderate numbers, confined to the first portion of the small intestine. When the infestation is severe specimens may be encountered throughout practically the whole length of the intestinal tract and on one occasion a number of worms were collected from the gizzard.

The effects of even a heavy infestation by this parasite do not seem to be very apparent among the older well-grown birds but in young poultry up to at least about three months old the presence of the parasites even in moderate numbers causes a noticeable drain upon the vitality of the host. This was shown in the case of a three-month old chicken which was extremely emaciated, dull, and anæmic. The feathers drooped and it did not make any attempt to move when approached. On post mortem 320 fully grown and innumerable immature *Ascaridia lineata* were recovered from the intestine which exhibited a markedly catarrhal condition.

Ascaridia columbæ (Gmel., 1790).

This nematode has been met with on several occasions in the domestic pigeon. Like *A. lineata* it apparently is well tolerated by adult birds even in such large numbers that the intestine for a great portion of its length is simply packed with specimens.

Ornithostrongylus quadriradiatus (Stev., 1904).

This slender nematode is represented in the material by a single male, which was recovered from a pigeon in Brisbane. It is recorded from Queensland for the first time.

Heterakis gallinæ (Gmelen., 1790).

The coecum worm was the commonest nematode seen and was present in 94·6 per cent. of the birds examined. The infestation was usually moderate without any noticeable pathogenic effects, but in three well-grown birds which yielded 2,030, 1,862, and 1,679 specimens respectively the coecum walls were markedly inflamed.

Capillaria retusa (Rail., 1893) Trav., 1915.

This fine hair-like nematode, which occurs in the small intestine, was very frequently recovered and in many of the birds the infestation was extremely heavy. It was present in 40 per cent. of the birds examined. On several occasions it has been implicated in outbreaks with serious mortalities, but the evidence that the mortalities have been due to this nematode alone has not been conclusive.

Capillaria columbæ (Rud., 1819).

Obtained from the domestic pigeon on two occasions and from the domestic fowl once. It may be readily distinguished from *C. retusa* by the spicule sheath of the male which is transversely striated posteriorly, while in *C. retusa* it is spiny. This species is recorded for the first time from Queensland.

Oxypirura parvovum Sweet, 1910.

The poultry eyeworm was not seen in any of the birds examined in Brisbane. The only specimens in the collection are from Townsville, but it is known that the species occurs as far south as Rockhampton. The intermediate host of this nematode is the roach *Pycnocelus surinamensis*, which is very common in Brisbane.

Acuaria (Cheilospirura) hamulosa (Dies., 1851).

The gizzard worm of poultry was not very frequent among the birds examined and only two cases of infestation were noticed, both of which comprised only a small number of worms. These worms are said to weaken the gizzard wall to such an extent that large pouch-like dilations are formed.

Acuaria (Dispharynx) spiralis (Molin, 1858).

Like the gizzard worm, this parasite is regarded as a comparatively infrequent species in the Brisbane area and has been seen only in one bird, where it occurred in the proventriculus.

Summary.

The helminth parasites occurring in the domestic fowl and domestic pigeon in Queensland as recorded from examinations of birds during the past two and one-half years are as follows:—

Host.—Domestic fowl.

Cestoda—

Davainea proglottina (Davaine, 1860).
Raillietina (Ransomia) tetragona (Mol., 1858) R.Bl., 1891.
Raillietina (Skrjabinia) cesticillus (Mol., 1858).
Hymenolepis carioca (Magahl., 1898).
Hymenolepis inermis Yoshida, 1910.

Nematoda—

Ascaridia lineata (Schneid., 1866).
Heterakis gallinæ (Gmelin., 1790).
Capillaria retusa (Rail., 1893) Trav., 1915.
Capillaria columbæ (Rud., 1819).
Oxyspirura parvovum Sweet, 1910.
Acuaria (*Cheilospirura*) *hamulosa* (Dies., 1851).
Acuaria (*Dispharynx*) *spiralis* (Molin., 1858).

Host.—Domestic pigeon.

Cestoda—

Raillietina (*Raillietina*) *nagpurensis* (Moghe., 1925)?

Nematoda—

Ascaridia columbæ (Gmel., 1790).
Ornithostrongylus quadriradiatus (Stev., 1904).
Capillaria columbæ (Rud., 1819).

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THE TRUE CLUB SPIRIT AT NORWELL.

A very fine community spirit was shown at the annual gathering of the Norwell Home Project Club on Pimpama Island, Queensland, recently. Mr. and Mrs. G. L. Opperman, whose family was well represented in the club membership, had offered as a special prize a very fine A.I.S. heifer worth. possibly, 20 guineas, the prize being offered conditionally that it should not be taken by one of the Opperman children.

As it happened, when the awards were announced, one of the donor's boys topped the list, and came forward to be presented with the prize calf. The young lad briefly explained to the club organiser that he preferred the calf to become the property of the second prize winner, whereupon the next on the list came forward; he, in turn, explained that as his people had no A.I.S. bull available he would prefer the calf to go to some other prize winner. At this stage the third prize winner stepped forward, and to add to the complications he announced that he also was one of the Opperman family, and therefore desired the prize calf to go to the next on the list. The fourth member on the list therefore became the possessor of the 20-guinea calf, and accepted the award very gratefully.

The head teacher, Mr. Avery, specially thanked the donors for their commendable club spirit, and reminded the gathering that, though the prize had created a good deal of confusion, it emphasised a remarkable community spirit and the goodwill one towards another characteristic of the very best there is in the Home Project Scheme.

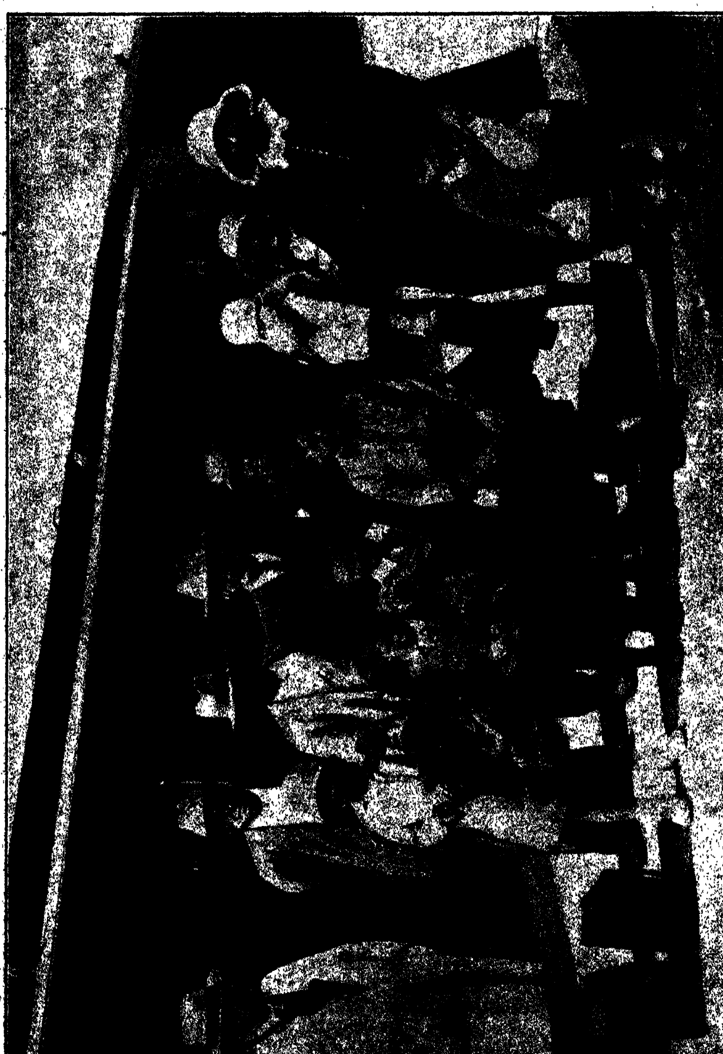

Plate 141.—Arrival of New Settlers at Beerburrum.

The group, which includes a family of sturdy young Australians, was welcomed by the Minister for Agriculture and Stock, Mr. Frank Bulcock (centre) and the Under Secretary and Director of Marketing, Mr. E. Graham (extreme left).

By courtesy, "The Telegraph," Brisbane.

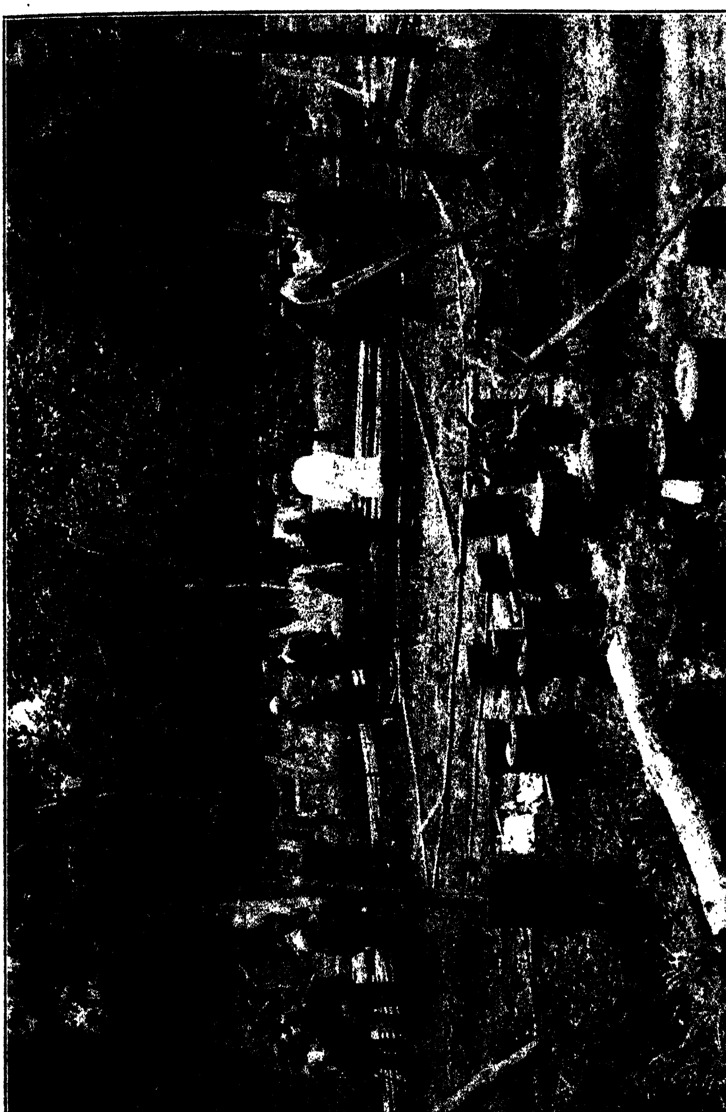

PLATE 142.—LAYOUT OF A TOBACCO GROWER'S FIRST HOME.

Plans and prospects discussed with the Beerburrum settlers by the Minister, Mr. F. W. Bulcock (with group on extreme left), the Under Secretary, Mr. E. Graham (right centre), and the Assistant Under Secretary, Mr. R. Wilson (left centre).

By courtesy, "The Telegraph," Brisbane.

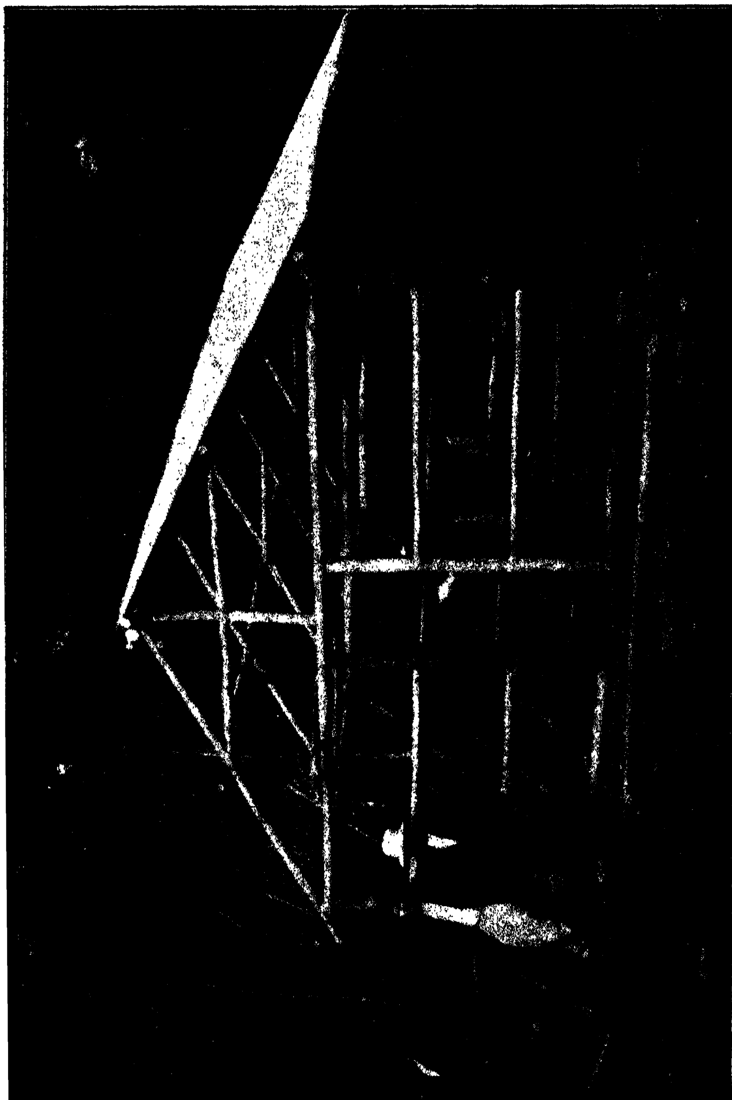

PLATE 143.—A SETTLER'S TEMPORARY HOME IN COURSE OF CONSTRUCTION.

Economy is the keynote of primary development on the Beerburrum Tobacco Settlement, so the round bush timber near the site comes in handy.

By courtesy, "The Telegraph," Brisbane.

PLATE 144.—A HAPPY FAMILY GROUP ON THE NEW TOBACCO SETTLEMENT AT BEERBURRUM.

The hut in the background is typical of the temporary homes built by the settlers. The Minister, Mr. Frank Bulcock (standing, centre), is taking a practical interest in the settlement in the vicinity of which very fine leaf has already been produced and has commanded a favourable market.

By courtesy, "The Telegraph," Brisbane.

PLATE 145.—PREPARING BEERBURRUM TOBACCO LANDS.

The Minister, Mr. F. W. Bulcock, discusses prospects with new settlers. Mr. E. Graham (Under Secretary) is also in the group.

By courtesy, "The Telegraph," Brisbane.

PLATE 146.—CHILDREN OF NEW SETTLERS AT BEERBURRUM VIEW THE PROMISED LAND.

By courtesy, "The Telegraph," Brisbane.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

(Continued from the July issue.)

PART X.

This is the tenth article of a series planned for the purpose of supplying information sought, from time to time, by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising in Queensland on relatively small holdings.

FARMERS' WOOL SCHEME.

THE Minister for Agriculture and Stock is prepared to assist farmers to obtain the best prices for the wool from holdings of less than 1,500 sheep, by receiving such wool, classifying it, and placing it on the market in bulk lines, thereby avoiding sale under Star Lot conditions.

A correct account of the wool will be kept, and each farmer will receive the amount received for same less the necessary broker's charges and other charges which are as follows:—

(1) A charge of 10s. per bale for classification. (This charge includes insurance in sheds, on rails, transit, and to selling broker's stores).

(2) All freight, handling, dumping, and rebaling.

(3) Other out-of-pocket expenses.

The Department of Agriculture and Stock will charge no commission; an advance of 60 per cent. will be made, free of interest, upon the estimated value of the wool as at the time of receipt of the wool in the Department's store.

The wool will be sold as soon as possible following a sufficient accumulation to enable wool to be sold to best advantage.

It must be understood that the limit of this arrangement is 1,500 sheep, and that the Department will not accept a clip from a greater number, and is prepared to take those classes that do not reach five bales.

The weights as taken in the Departmental Store and the classification before sale is to be accepted as final.

Farmers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, of their intention, before consigning the wool, advice of which, with all particulars, brands, weights, &c., should be given.

Consign the wool to the Under Secretary, Department of Agriculture and Stock. Roma street, Brisbane.

Recommendations.

(*a*) The bales should be branded on the cap only, so that the same packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(*b*) Locks and belly wool should be kept separate in bar bales.

(*c*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

(*d*) All merino wool should be kept separate from other grades and breeds.

Sheep belong to the ruminating or cud-chewing type of animals, of which there are two orders, goats and the sheep, or ovis order, of which there are three varieties, *Ovis Ammon, Ovis Musmon, Ovis Aries* or domesticated.

Many sheep are without horns, other breeds produce horns when a few days old. The various ages of sheep are described thus—Lambs, weaners, hogget wethers or ewes, rams. If shorn as a lamb they are called shurled hoggets after shearing.

The teeth are the best medium by which the age may be ascertained.

The accompanying plate, taken from Professor Simmonds' "On the Age of the Ox, Sheep, and Pig" is an illustration of the incisors or cutting teeth. In Plate 7 is shown the molars or grinders at various periods of the sheep's life up to maturity, which is, roughly, four years (Armitage's "Sheep Doctor"). At maturity a sheep has thirty-two teeth, eight incisors and twenty-four grinders.

At birth a lamb possesses two central temporary incisors, and at the end of four weeks all the temporary incisors (eight) are up, with three molars in each of the upper and lower jaws.

From the age of four weeks to the time of cutting the central permanent incisors, at from twelve to fifteen months, the only changes that occur are in the molars. At three months the fourth molar is cut, and is a permanent tooth. Six months later another molar, the fifth, is to be seen. At eighteen months the sixth permanent molar is cut; the third temporary molar, like a shell, covers the top of the permanent tooth, while the first and second permanent molars have pushed off the temporary ones. Thus, a sheep has all its permanent molars at from eighteen months to two years old.

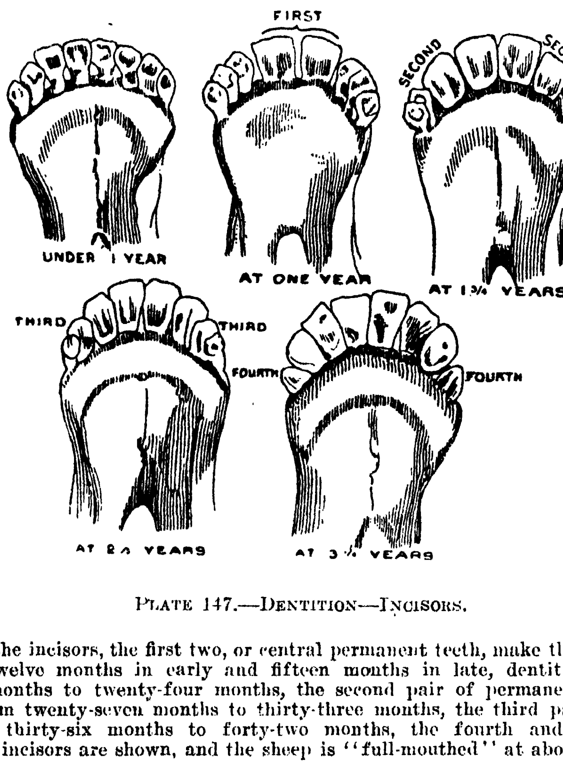

PLATE 147.—DENTITION—INCISORS.

With the incisors, the first two, or central permanent teeth, make their appearance at from twelve months in early and fifteen months in late, dentition. At from eighteen months to twenty-four months, the second pair of permanent incisors are up: at from twenty-seven months to thirty-three months, the third pair are in use; and from thirty-six months to forty-two months, the fourth and last pair of permanent incisors are shown, and the sheep is "full-mouthed" at about four years.

After this, it depends upon the class of country, and the early or late maturity of the breed, as to the wear of the teeth, whether the mouth is defective or otherwise. Only experienced sheep-masters can, even approximately, give the age of any particular animal. In the case of "broken-mouthed" sheep it is wise, if only three or four or fewer teeth are left, to pull them out and leave the animal "gummy." They cannot bite with odd or gapped teeth as well as they can with gums. But do not buy old sheep unless very cheap, and other conditions justify the purchase.

Other indications of old age are dependent paunch, sagging of the loins, distended nostrils, deterioration of fleece in quality and quantity, and malformed feet.

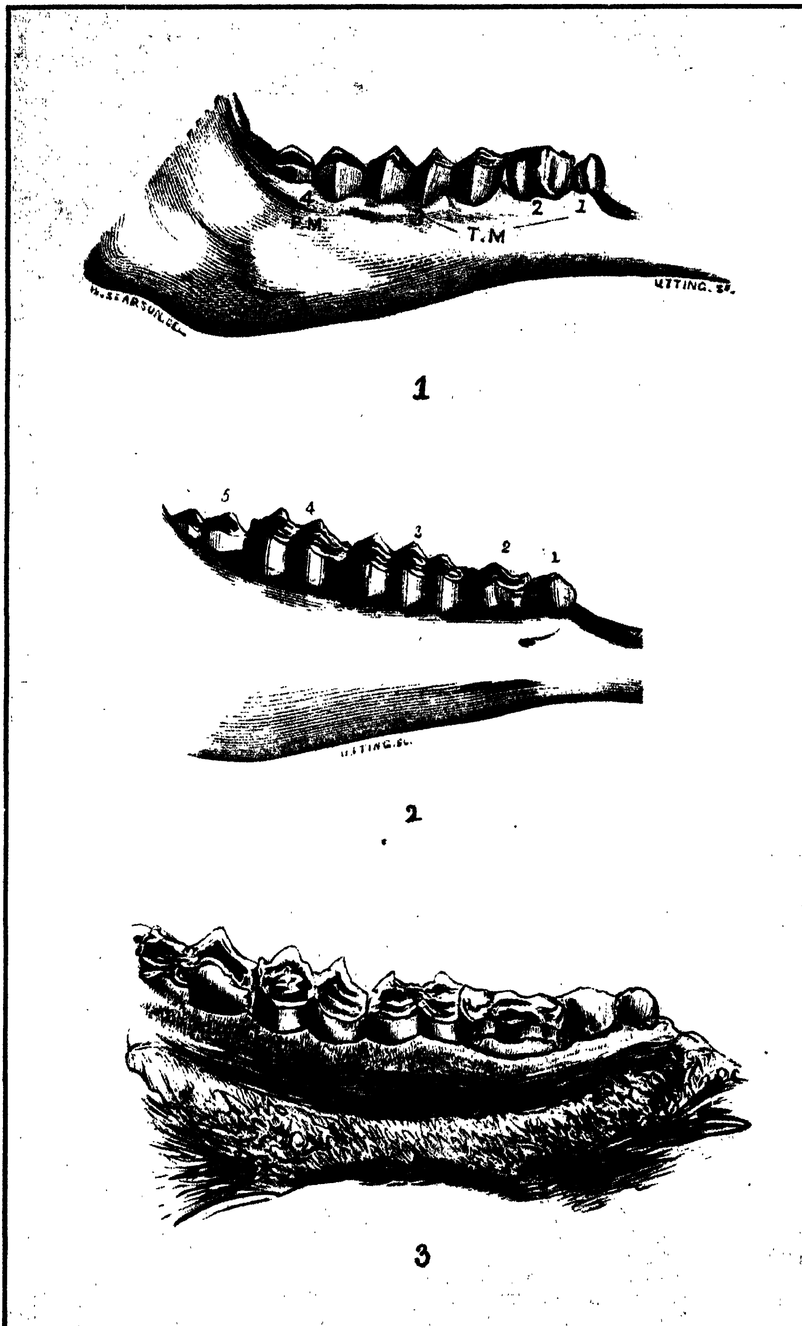

Plate 148.—Dentition—Molars.

LICKS FOR SHEEP.

In providing a lick for sheep, it is necessary to possess some knowledge of the elements required by the sheep and, further, to ascertain to what extent these elements are supplied in their food and water.

When our grasses are in the growing stage most of them will provide a sufficient supply of all the necessary elements required, but when the grasses become dry and perished they lose their virtue.

This is a common and regular occurrence especially in regard to our native grasses. In many districts winter herbage will respond to light rains, and those that are relished by the sheep are very useful as they provide a most succulent bite for sheep when the natural grasses contain very little nutriment. If suitable licks are supplied during the time that grasses are dry and no herbage available they will whet the appetite, assist digestion and assimilation, and in this way create a better relish for the rough food that is available and assist the sheep in making better use of it. During the time the pasture is good the sheep should lay on condition, thereby fortifying themselves against times of scarcity or when the feeding value of the pasture has deteriorated. If the sheep can be held in fair condition at all times, better results will be secured both in respect of wool production and immunity against pests and disease. Wethers can undergo hardships to a greater extent than breeding ewes. Therefore the ewe flock should receive a greater amount of attention. If herbage is wanting during the time the grasses are dry there is likely to be a protein deficiency which can be supplied by feeding with concentrates such as sheep cubes and nuts and maize at the rate of 2 oz. per day. Should this deficiency be supplied through a lick, care must be exercised that it contains the requisites for supplying mineral deficiency.

As all our pastures when in a dry state are wanting in mineral constituents, and knowing that sheep require a certain percentage of it for their wellbeing, it is most economic to supply it through a lick. The water supply available to sheep varies considerably and must be given full consideration. In the case of sub artesian water it is most satisfactory to have it analysed.

Sheep can take a fair amount of salt in their water, the chief factor being the balance between it and other minerals, but the greater the amount of salt it contains the less need there is for salt in their lick. In the case of soft water which contains little or no salt, the sheep will require to have a fair percentage of salt added.

The actual quantity of salt required by a sheep under normal conditions is from 4 to 5 lb. a year, and this quantity is usually fully supplied during that portion of the year when the grass is growing. During the same period other mineral constituents, lime, and phosphoric acid are also available, probably in suitable quantities for the maintenance of adult sheep, but in the case of pregnant ewes and during the lactation period their requirements increase considerably, as is also the case with growing lambs.

Where the water is saline and the pasture deficient in lime and phosphoric acid a lick be necessary, but to add salt (as many pastoralists do during a drought) only aggravates the trouble. Therefore it should be omitted.

Finely ground Nauru phosphate contains nearly equal quantities of lime and phosphoric acid, but, owing to its having neither taste nor odour, sheep will not take readily to it. When salt is not necessary, linseed or other meal can be added in such quantity as to induce dry sheep to take up to ½ oz. of Nauru phosphate a day, although they can eat more without injury. If the meal induces dry sheep to eat more than that quantity it can be reduced. Molasses sprinkled over the lick, and then thoroughly mixed, is also useful for the same purpose. Sheep as a rule will not change readily from one lick to another. If they are on a lick that does not contain a high proportion of phosphate it can be added to the lick that they are used to, having the aim to ultimately reach the basis of 45 per cent. finely ground Nauru phosphate and 35 per cent. crude ground salt, the remaining 20 per cent. to be added to suit special purposes and may include 10 per cent. of meals.

In some cases 3 per cent. sulphur, 2 per cent. sulphate of iron, and 5 per cent. molasses will be found suitable. When the food is dry, 5 lb. of Epsom salts to every 100 lb. of lick can be added with advantage. If potassium iodine is required, add it at the rate of 1½ oz. per 100 lb. mixed lick; so far we have no evidence

that such deficiency exists. To add it, spread the mixed dry lick evenly over a clean floor, not too thick, dissolve the 1½ oz. iodine in 1 pint of warm water and sprinkle it evenly over the lick and mix thoroughly and evenly.

Experiments have been carried out in recent years by the Department of Agriculture and Stock, South Africa, on sheep infested with worms, and many lick mixtures were tried. As recorded in subsequent reports, it is recommended for practical stock raisers, on farms which are infested with worms, to supply a daily lick which contains 14 lb. of tobacco dust added to 100 lb. mixed lick, which is an important measure for reducing the infection of nodule worms in sheep and in keeping up the body weight, although the lick does not act as a preventive.

The best method of administering lick is to place it in a V shaped trough capable of holding a bag or more with an opening the full length of the trough 1½ inches wide and 2 inches above the lick board, which should be 10 inches wide and about 15 inches from the ground.

If the container is securely covered with a removable galvanised iron lid, the lick will retain its normal condition and fall by gravitation through the bottom opening as the lick is consumed from the lick board.

AUTOMATIC LICK CONTAINER ON ELLANGOWAN, DARLING DOWNS.

This lick container consists of a V-shaped trough with a lick board running at the apex of the V at a suitable distance. In practice, the roof was taken off, the salt (coarse Liverpool) placed in the trough, and the lid replaced. The salt by gravitation falls through the slit, 1½ inches wide, running the full length of the lick board at the apex, and stays until the sheep lick it away. As fast as it is taken from the lick board it is replaced automatically from the trough. Herewith is a drawing which speaks for itself—

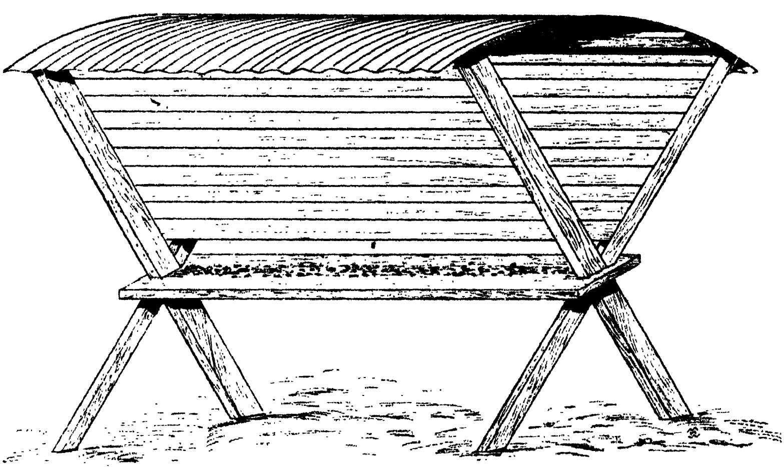

PLATE 149.—SALT-LICK FOR SHEEP AT ELLANGOWAN.

There are many good licks now on the market, all of which must carry a label setting out the ingredients contained, which acts as a guide to the sheep farmer as to their value.

In order to become better acquainted with the deficiencies which occur in our pastures, the Department has secured many samples of water, grasses, shrubs, and trees on which the sheep have been living for the purpose of analysis, the result of which should act as a guide in recommending licks for sheep running on the pastures from which the samples were taken. More recently the contents from the different stomachs and intestines of sheep were secured and analysed. Some of these sheep were specially fed for two weeks prior to slaughter, and the analysis showed very important results.

THE CULTIVATION OF MAIZE.

By C. J. McKEON, Instructor in Agriculture.*

MAIZE is grown extensively in Queensland along the coastal areas and inland within the 30-inch rainfall belt, the chief districts being Moreton, Wide Bay, and Darling Downs, which between them usually produce over 80 per cent. of the State's total crop. The next district of importance is the Atherton Tableland, which, due to the comparatively safe rainfall, has much the highest yield per acre over a number of years.

It will be seen from this what a vast area is suitable for the production of this crop, and also the wide variety of soils on which it is being successfully produced.

Providing the rainfall is sufficient, and the land is naturally well drained, maize can be grown on any good quality soil, the alluvial flats found along rivers and creeks and the deep volcanic soils being particularly suitable for its growth. Good drainage is absolutely essential, as maize will not stand wet feet.

It is one of the easiest crops to grow, and, unfortunately, advantage is frequently taken of this fact, and many crops are grown under conditions which would be fatal to many other crops.

To get the best Results.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during the winter, and allowed to lie in the rough until the early spring. The action of the frost and rain will have a sweetening effect on the soil, and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a nice fine condition.

If a crop of weeds is turned under during the second ploughing planting should not be carried out for a few weeks at least to allow decomposition to take place. On land which is not too heavy and moist this will be greatly assisted by rolling, as the rolling will consolidate the soil and cause the decomposition to take place much more quickly. It will also at the same time make a good firm seed bed. Rolling should always be followed by a light harrowing.

Preparation of Seed Beds.

The preparation of the seed bed is one of the most important points in the production of maize, and no amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in growth but in the colour of the foliage also, between crops grown side by side, and where one has been sown on thoroughly prepared and the other on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a good seed bed—and by a good seed bed is meant not only a well-prepared one but one in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to Plant.

The best times to plant will naturally vary according to the different districts. In districts which have a long growing season and a comparatively regular rainfall, this can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district in which it is to be grown; and secondly, to try and have the crops tasselling during periods in which there is usually a good chance of getting rain. Maize must have moist conditions during tasselling, and if hot dry winds occur during this period the pollen is destroyed and fertilization cannot take place.

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* In a radio lecture from 4QG.

Seed should be sown in drills spaced from 3 feet 6 inches to 4 feet apart, nothing less than 4 feet for the tall-growing, late-maturing varieties. As a general rule, single spacing gives the best results, the grains being dropped singly along the rows, with a distance of approximately 12 inches between the grains for the quick-maturing varieties and from 15 to 18 inches for the late-maturing varieties.

From 9 lb. to 10 lb. of seed is sufficient to plant an acre when sown in this manner.

The most satisfactory method of sowing is with a seed drill, as in this way it is possible to get a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

Field Practice.

The land can be lightly harrowed even until the plants are a few inches high. This will not only destroy young weed growth but will also greatly improve germination in the event of heavy rain falling shortly after planting and causing the surface soil to become caked. Many growers are afraid of injuring the young crop, but if harrowing is done on a bright warm day, when the young plants are not brittle, and care is taken to prevent dragging of rubbish which may collect under the harrows, the crop not only will not be injured but will be greatly benefited.

In districts where the rainfall is heavy, and difficulty is experienced in keeping weed growth in check, many growers before planting run out shallow drills a few inches deep with a light plough or other suitable implement, and then sow along the bottom of the drills with the planter. When the young plants are high enough the cultivator is worked through the rows, and is set in such a way that the soil is drawn in around the plants, filling up the depression made when drilling, and thereby smothering the young weeds which have sprung up in the rows. This, of course, to be effective must be done while the weeds are very young.

During the early stages of growth the crop should receive at least two good inter-row cultivations to keep weed growth in check and to keep the surface soil in a nice friable condition, and on no account should the surface soil be allowed to remain in a caked condition while it is possible to work a horse cultivator in the rows.

Harvesting.

The picking of the crop still remains a hand operation, and although machines have been tried, one of which was invented and built in Queensland and which performed well at the trials, none of these have so far reached a stage where they can be successfully worked in the majority of crops.

The ears should be allowed to dry out thoroughly before being shelled, for, apart from the fact that the grain if shelled too early is likely to heat in the bags, a large amount of grain is broken and damaged during the shelling process and the appearance of the sample is spoiled. A considerable wastage also occurs through the cores being too soft to withstand the pressure of the drums, and these break up into small pieces and pass out through the machine with the grain still attached.

Cost of Production.

To make maize-growing profitable the cost of production has to be reduced to a minimum, and this can only be done by increasing the yields by the use of pure strains of seed which have proved suitable for the locality, and also by practising the best cultural methods. Good quality seed not only gives an increased yield per acre, but also an increased return per bushel, as a better price will always obtain for grain which is of good even type and colour.

The use of modern machinery also plays a very large part in lessening the cost of production, and hand work must be eliminated wherever possible, and the combined husker and sheller has done a great deal towards this.

Storage.

Maize can be stored for very long periods at no very great cost other than the initial cost of the tanks, yet growers frequently dispose of their entire crops for very low prices during flush seasons, whereas if they had the storage accommodation, and, of course, were in a financial position to store their grain for a time, they would receive very much better prices. One thousand gallon tanks are very suitable for this purpose, and hold approximately 3½ tons of grain. The lids of the manhole and shoot should be so constructed that they can be made quite airtight by puttying or by the

use of puddley clay. First and foremost the grain should be thoroughly dry, and should not contain more than 14 per cent. of moisture at the time it is placed in the tank.

If the grain is showing signs of weevil it can be fumigated by placing a couple of saucers on the top of the grain and pouring into these 1½ to 2 lb. of carbon bi-sulphide. Place the lid on as quickly as possible and puddle up the edges of the manhole cover to make it perfectly airtight. The tank should be kept sealed for twenty-four hours, or longer if desired, and then remove the lids from the manhole and discharge shoot and cover the discharge shoot with strong gauze to prevent the grain from running out. After forty-eight hours the covers can be put back. Grain for seed purposes should not be left for such a long period, and should immediately after fumigation be exposed to the air, otherwise the germination may be seriously affected.

Carbon bi-sulphide is highly inflammable, and care should be taken to see that no lighted pipe or other light is near the tank when the fumes are released.

DISEASES OF THE PIG.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PILES.

THE rectum is that part of the lower bowel acting as an outlet from the body—through the anus—for the solid portion of the waste intestinal products.

Protrusion of the rectum indicates that portion of the lower bowel has been forced out of position, and is noticed as a large fleshy-looking tumor beneath the tail. The trouble is sometimes referred to as prolapse of the rectum or anus, and a similar condition in the case of the genital organs of the sow is spoken of as inversion of the uterus, or prolapse of the lower portion of the sow's breeding passage. In non-technical language this trouble is frequently referred to as "Piles."

This disorder in pigs occurs with animals of all ages, but is more frequently noticed in pigs in the fattening stages—i.e., from four to six months of age. It sometimes happens in very young pigs, but is not usually so serious with them as with more mature stock.

Causes.

Ordinarily the trouble results from violent or continuous straining, such as is to be expected where the animal is severely constipated or is suffering from profuse diarrhœa, though pigs that are out of condition or are overfat are not entirely free from risk of the trouble. Breeding sows rearing litters, or those approaching the farrowing stage, are also subject to it, while a number of cases have been noted in sows not in pig that have reared their litters and had not again been mated. In these cases the exciting causes are traceable to affections of the bowels or breeding organs, while some authorities are of opinion that bladder troubles, gravel, gallstones, or retention of the urine due to inflammation are often responsible. It will be readily understood that diarrhœa is an exciting cause, so also is the constant straining after difficult farrowing, or in cases of retention of afterbirth. Doubtless some cases are due to irritation caused by intestinal parasites or the too free use of purgatives or foods of a gassy nature like buttermilk, whey, soup, offal, or decayed fruit.

Treatment.

Treatment will depend entirely on the condition itself and the class of animal affected. If the bowel protrudes more than an inch, as it often does, or if the trouble has not been noticed till the fleshy-looking tumour has become a dark bluish-red colour, is swollen, lacerated, or is bleeding as a result of exposure, the treatment is much more difficult than in simple cases in young pigs noticed soon after feeding. Similarly inversion of the uterus in a breeding sow is very difficult to treat. In most cases also the pig is a very bad patient, and is not only fractious and noisy but is difficult to restrain while treatment is in progress.

If treatment cannot be arranged immediately, or if the animal is ready for the butcher, it is better to slaughter and clean the carcass and utilise same as fresh pork, for this trouble is not one that would lead to condemnation if the carcase is otherwise normal. If treatment is to be proceeded with one of three methods must be employed.

Firstly, the protruding portion must be returned to its proper position; secondly, it must be kept there; or thirdly, it must be removed in part or whole.

In the first two cases the protruding portion should be thoroughly washed with warm water to which carbolic disinfectant has been added. If the animal is fractious and struggles to be free it may be useful to administer a drench containing morphia or opium and treacle or honey (which the chemist would prepare). The parts should then be well smeared with carbolised vaseline or other healing ointment. After thoroughly cleansing the protruded part must be forced back into position and be held there for a few minutes; should it be forced out again it must be replaced. In very bad cases a few stitches of catgut or silk thread may be effective. The animal must be kept very quiet and very clean and be without solid food for twenty-four hours or more, and then only be fed very lightly for a week or ten days. Prior to treatment an enema of warm soapy water to clean out the lower bowel and free it of accumulations of dung will be well worth while, this to be followed by a liberal dose of castor oil in warm milk repeated the following day if necessary.

An old stockman advises that syringing the anus with cold water will often prevent recurrence of the trouble once the protruding part has been replaced—this, of course, to prevent straining and forcing the bowel out.

There are cases, however, in which the protrusion is so persistent that more drastic treatment than the above is necessary. Where such is the case it is advisable to secure the services of a district Inspector of Stock or Veterinary Officer or the help of an experienced farmer accustomed to handling sick animals.

The protruding part may, after thorough cleansing, be treated by passing a ligature of strong silk thread or catgut around as close to the body as possible, and tying tightly by means of a double knot. This checks the flow of blood to the area, which will then gradually slough off, but during this treatment the bowels must be kept very loose by the use of purgatives, and the affected area must be kept as clean as possible in order to prevent infection and infestation by flies, &c. Sloughing off will probably take several days. Applications of stockholm tar may be effective in keeping the parts clean. The following ointments are very useful in treating open wounds:—

Antiseptic Oils.

Recipe No. 1, specially advised for farm and homestead use for application to open wounds, sores, is made up by dissolving 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When quite clear add to it 1 pint of olive oil. Shake well and bottle and label distinctly, Antiseptic Oil No. 1.

Recipe No. 2 is more suitable for aged pigs in which wounds are more pronounced and in which the healing process is more lengthy. It combines the active ingredients of the above with a more tenacious and adherent basis. Olive oil is replaced by Stockholm tar. The formula in this case will be:—Dissolve 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When dissolved and quite clear add 1 pint of Stockholm tar. Shake well. Bottle and label distinctly, Antiseptic Oil No. 2.

These antiseptic oils are much preferable from a humane standpoint, and as they stimulate natural healing processes and repel flies are to be recommended in preference to kerosene and fat or other bush remedies.

Thorough cleanliness and care in the feeding of the animal play an important part in treatment.

BACON MANUFACTURE IN THE NORTH.

The North Queensland Co-operative Bacon Association, at Floreat Siding, Mareeba, continues to make satisfactory progress under the general supervision of the Northern Pig Board. During a period of very short supply 792 pigs were handled during the midwinter period, July, of which 644 were taken over by the Bacon Association, and the balance sold live to butchers for use as pork. Sales of the factory's products continue satisfactory, and in common with other factories in Queensland pig prices have been increased to the rate current at the 1st September—5d. per lb. dressed weight, 90 to 120 lb. prime baconers, with a tendency to still further increases as the season advances. The supply of pigs in the far North is not nearly sufficient to maintain trade connections.

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

Arrangements have been completed with the Australian Broadcasting Company for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 4th October, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures arranged:—

SCHEDULE OF LECTURES.

By Officers of the Department of Agriculture and Stock.

Radio Station 4QG, Brisbane (Australian Broadcasting Company).

Tuesday, 4th October, 1932—"Potato Pests." J. A. Weddell, Assistant Entomologist.

Thursday, 6th October, 1932—"Shade and Ornamental Trees." C. T. White, Government Botanist.

Tuesday, 11th October, 1932—"Tobacco Pests." R. Veitch, B.Sc., Chief Entomologist.

Thursday, 13th October, 1932—"Cotton Thinning and Spacing." R. W. Peters, Cotton Experimentalist.

Tuesday, 18th October, 1932—"Constituents of Stock Foods and Their Functions." E. H. Gurney, Senior Analyst.

Thursday, 20th October, 1932—"Tobacco Diseases." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Tuesday, 25th October, 1932—"Valuation of Stock Foods." E. H. Gurney, Senior Analyst.

Thursday, 27th October, 1932—"Rust in Wheat." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 1st November, 1932—"Comments on Various Stock Foods." E. H. Gurney, Senior Analyst.

Thursday, 3rd November, 1932—"Diseases of the Passion Vine." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 8th November, 1932—"Feeding Standards for Stock." E. H. Gurney, Senior Analyst.

Thursday, 10th November, 1932—"Insects Attacking Young Cotton Crops." R. W. Peters, Cotton Experimentalist.

Tuesday, 15th November, 1932—"Bot Flies." F. H. S. Roberts, M.Sc., Entomologist.

Thursday, 17th November, 1932—"Cleanliness and Comfort for the Pig." L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 22nd November, 1932—"Back to the Land." J. F. F. Reid, Editor, "Queensland Agricultural Journal."

Thursday, 24th November, 1932—"The Cultivation and Green Manuring of Orchards." W. J. Ross, Senior Instructor in Fruit Culture.

Tuesday, 29th November, 1932—"Corn Ear Worm in Cotton." R. W. Peters, Cotton Experimentalist.

Thursday, 1st December, 1932—"Fruit Packing." (First Lecture.) J. Gregory, Instructor in Fruit Packing.

Tuesday, 6th December, 1932—"Topping, Suckering, and Harvesting Tobacco." R. A. Tarrant, Instructor in Agriculture.

Thursday, 8th December, 1932—"Fruit Packing." (Second Lecture.) J. Gregory, Instructor in Fruit Packing.

Tuesday, 13th December, 1932—"Housing and Maintenance of the Angora." J. W. Munro.

Thursday, 15th December, 1932—"Hot Weather Complaints in Pigs." E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Tuesday, 20th December, 1932—"Bird Life." W. D. Wilson, Ranger, Animals and Birds Acts.

Thursday, 22nd December, 1932—"The Future of Agriculture." J. F. F. Reid, Editor, "Queensland Agricultural Journal."

TANNING MARSUPIAL AND OTHER SKINS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.*

WE have received numerous letters asking for instructions in curing and tanning marsupial and other skins. The following recipes should prove satisfactory:—

The general principle is to trim off the useless parts of the skins and remove all fat from the inside. Soak the skins in warm water for about an hour; then apply a coating of borax, saltpetre, and Glauber's salts, 1 oz. of each, dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This latter mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. of alum, 3 oz. salt, and 2 oz. of saleratus; dissolve these in hot water, and when cool soak the skin in it for twelve hours. Wring out, and hang up to dry. If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

Another method is, first to remove the flesh and fat. Then wash the skin in a solution of sal. soda and water. Take 4 oz. of powdered alum, 8 oz. of salt, 1 quart of new milk to 4 gallons of salt water, and 1 pint of prepared starch. Stir well, and then put in your fur skins. Air them often by hanging them over a stick laid across your tan tub. Handle them occasionally until they have been in the liquor for a day or two. Then remove the skins and add to your liquor a half teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour. Then take them out and wring and rinse off in soft lukewarm water, and hang them up in a cool place. When they begin to get white, work and stretch them till they are dry.

Hides of larger animals, such as kangaroos, calves, &c., should remain longer in the solution.

To cure a tough skin, trim it on the flesh side with a sharp knife and then well brush with a solution of 2½ lb. of alum and 1 lb. common salt in 1 gallon of warm water. The skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board to dry.

Note that each kind of skin requires some special treatment—that is, all skins cannot be tanned in the same manner, but the general principle is the same as above.

Still another method is by what is known as "the lightning tanning process," which is said to be the quickest method of tanning wallaby, rabbit, and other skins, and is very simple. It is as follows:—Pour 5 or 6 quarts of boiling water over 2 quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to blood-warm water as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add 1 oz. of sulphuric acid (H_2SO^4). Immerse the skins in the liquor, stirring them occasionally until tanned, which will be in about twenty minutes. When tanned, rinse in clean water and hang out in a shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft and white.

Preparing Wattle Bark for Tanning Small Skins.

Chop a quantity of wattle bark finely and soak in a barrel to extract the tannin. The quantity of bark to the gallon of water is difficult to state, as the bark varies in quality. Make the liquor fairly strong, like very strong tea, and when ready pour into a clean wooden cask, and throw in the skins and let them be for a week or two. Then take them out, spread on a slab, and scrape any remaining flesh off and trim them up. Put the skins back into the cask for another week, after which wash them in clean water and peg them, flesh side out, in a shady place to dry. If they are stiff rub them well, apply a mixture of mutton fat and neatsfoot oil, and pull them backward and forward over a smooth pole to soften and stretch them. Heavy hides and skins take much longer to tan, and ordinarily can be prepared by other methods.

How to Prepare Skins for Rugs, Vests, and Mats.

A simple and inexpensive method of preparing for use skins of sheep, goats, and other animals with wool or hair on is this:—

Take one spoonful of alum and two of saltpetre, pulverise and mix well together, then sprinkle the powder on the flesh side of the skin and fold over so that two

* Revised from previous notes and brought up to date by the inclusion of additional recipes and extracts from various publications.

powdered sides will come together leaving the wool outside. Then fold the skin up as tight as you can and put it in a dry place. In two or three days, or as soon as it is dry, take it down and open and scrape the flesh side with a blunt knife until it is clean and supple. This completes the process, and makes an excellent saddle cover. If it is desired to use the skin for a rug, it should be well washed in soapsuds, rinsed in running water, and allowed to get partly dry, then rubbed together until it is soft and dry.

Another Method of Tanning with Alum.

The "New Zealand Journal of Agriculture" recommends the following method of tanning skins and fleeces with the cover on, for use as rugs, clothing, &c.:—

Mix bran and soft water sufficient to cover the skins. Immerse them and keep them covered for twenty-four hours; then remove, wash, clean, and carefully scrape off all flesh. Then take 1 gallon of hot water and dissolve in this 1 lb. of alum and ¼ lb. of salt. When cool enough to put the hand in immerse the skins again and leave for twenty-four hours in oatmeal and warm water. Partially dry in the shade, and finally rub until entirely dry. This leaves the skin like white leather and fit for use.

Process of making Basil, also Chamois Leather (so called).

The skins, having passed through the process of washing, are soaked in lime water, then in a mixture of bran and water or in a weak solution of sulphuric acid, after which they are beaten in a mill or are passed or dried out until no moisture remains. Fish oil is then poured over the skins, which are again well massaged until they are impregnated with it. This is done repeatedly until the skins can receive no more oil, and then they are hung for a short time in a heated room. They are then washed in a solution of potash (which the chemist will make up), which removes any oil that may still remain about the leather. In making chamois leather the wool and outer skin is removed, leaving the basil or pelt (free of wool) as the material to be treated. The process is much the same as for basils.

Tanning a Sheepskin with Wool on.

A fresh skin is the easiest to handle. Put the skin into a barrel of fresh spring water if it is newly taken off, say, within twenty-four hours. Soak for twenty-four hours; then lay over the side of a barrel and with the flesh side out. An old scythe which will fit oval around the skin on the barrel is excellent for a scraper. Stand at the end of the barrel on which one end of the skin hangs over, raise the end of the barrel so as to come up to the lower part of the abdomen, press the body firmly against the skin so as to hold it firmly, and scrape with the scythe blade till all the tallow, flesh, and blood are scraped off, then turn the other end of the skin in the same position and work likewise. If the skin has become dry in places, as often happens, scrape a little oftener, perhaps seven or eight times or strokes. If the skin is perfectly fresh it should be scraped all over the second and third day after it has been put in the water, allowing about fifteen to thirty minutes each day. If it has become dry a little more scraping would be better, and a day or so more soaking. If the skin is dirty on the wool side, tramp it in the barrel or pound with a plank before taking out for the second day's scraping, also scrape on the wool side, dashing water on it occasionally. Do not allow it to come into contact with the wool, as it has a tendency to colour it.

After the skin is ready for the tannage, lay the skin out flat, flesh side up, and apply the following:—Mix together pulverised alum ½ lb., common salt about 1 lb., saltpetre ½ lb., and about twice the quantity in bulk of bran as you have of the above chemicals. Mix them together and sprinkle a nice even layer over the skin, folding the edges over to the backbone, then roll from the head till you roll it tight. Put into a cool place for a week, keep damp. After a week open up and put on the other half of the bran and chemicals after scraping off the first applied; leave about another week. It would be advisable to dampen by sprinkling a little water—say, a pint—before the second application. After the second week hang over a scantling, hold the skin on one side of the scantling with the flesh side out, then start at the scantling and scrape down towards the ground with a mincemeat chopping knife till the skin is softened on the whole flesh surface, then do the same with the other end of the skin. Do this a day or two later as the skin dries. Then take a horse mane comb and comb out the wool, and it will make a fine rug or mat.

THE VALUE OF GREEN MANURING.

By H. W. KERR.

IT is pleasing to note that the practice of green manuring has become firmly established with the more progressive of our Queensland canegrowers; but there are still altogether too many of our farmers who fail to appreciate the true worth of this excellent practice. When it is remembered that every grower is obliged to fallow one-quarter of his cane land each year, it should not be necessary to emphasise the importance of a simple, convenient, and inexpensive method by which the productivity of the soil might be improved at this time in readiness for the succeeding cane planting season. Green manuring fulfils all these demands, and though the benefits which follow the growing and ploughing under of a crop of legumes have been repeatedly emphasised, their importance is such as to warrant further repetition.

Green Manuring v. Bare Fallowing.

When the last ratoon crop has been harvested, the grower has the choice of either allowing the land to rest under bare fallow, or planting up the area with a cover crop. A comparison of the relative merits of the two methods is interesting. Firstly, the exposure of the bare land surface to the torrential rain of our wet season has a decidedly harmful influence on the physical condition of the soil. Each raindrop acts as a tiny hammer helping to drive together the individual soil particles, causing the soil mass to become consolidated and destroying its favourable crumb structure. The presence of a cover crop at this time acts as a most effective buffer, and guards the soil against these evil influences. This effect is indeed one of the major virtues of the cover crop, and is reflected in the ease with which the land may be subsequently reduced to a state of good tilth when the legume has been ploughed under.

Secondly, the presence of a growing crop results in the absorption from the soil of appreciable quantities of available plant foods, much of which might be lost by leaching under bare fallow conditions. These are returned to the soil when the crop is ploughed under, to become available to the succeeding cane crop after the legume has rotted.

Thirdly—and this is most important from the point of view of the maintenance of an adequate supply of plant food in the soil at low cost—the leguminous crop is instrumental in adding to the land a net gain of as much as 200 lb. per acre of nitrogen, in a form which readily becomes available to our economic crop. This is brought about by the very interesting association which exists between all legumes and a peculiar set of soil microbes which invade their roots, where they establish colonies and continue to live and multiply under a condition of perfect harmony with their host. The presence of these microbes is manifested by the formation of those peculiar nodules so frequently observed on the roots of beans and peas. The myriads of minute organisms obtain from the legume the sugars which serve as their food supply, and in exchange they manufacture and yield a supply of nitrogenous compounds which nourish the bean or pea crop. The nitrogen from which these important foods are built up is drawn not

from the soil, but from the atmosphere in the gaseous condition, in which form it is quite valueless to higher plants. The nitrogen compounds are utilised by the host plant in elaborating the proteins which constitute an important part of its tissues; and when the green manure crop is subsequently ploughed under, the rotting of the plant stems, leaves, and roots in the soil results ultimately in the production of an abundance of nitrates, so essential to the nutrition of our cane crop.

A fourth benefit to be derived from the green manurial treatment is one the importance of which is frequently overstressed; that is, the gain in soil humus which is associated with the practice. A little reflection and simple calculation will show that the gains to be expected from the treatment have been greatly exaggerated. It should be emphasised that this note of disillusionment is struck, not with the object of discouraging our farmers from following this excellent practice; but rather to stress the fact that if they would attain success in the direction of humus conservation, more rigorous steps must be taken. Of this aspect of the question more has been said elsewhere.

Finally, unless precautions are taken to control weed growth, the "bare" fallow frequently results in a heavy production of weed seeds which add to the difficulties of the subsequent cultivation.

This brief discussion of the major benefits to be derived from green manuring should make it quite clear that bare fallowing on the cultivated lands of our coastal belt of high rainfall is a practice which cannot be too strongly discouraged.

The Choice of a Suitable Legume.

A very important factor in the successful growth of a leguminous crop is the selection of a suitable species or variety for the particular set of soil and climatic conditions under review. Mauritius bean, cowpea, rice bean, and giant cowpea have all received attention in our cane areas. Mauritius bean is most highly favoured in our Northern areas, while cowpea has been the standard crop in the Southern districts. Of recent years a species known as Poona pea has been tried out on the Mackay and Bundaberg lands, and the present indications are that it will speedily replace the familiar cowpea (to which it is closely related) in these districts.

The essentials of a satisfactory legume are—(1) that it should germinate and grow even under the adverse conditions which are so frequently associated with early summer weather in Queensland; (2) that it should afford an effective cover in a minimum of time and thus smother the growth of weeds and grasses which are all too ready to establish themselves; (3) that it should be at least tolerant to the attack of the bean fly maggot which so seriously affects late-sown cowpea crops in our coastal areas; and (4) that it shall attain its peak of succulent growth at a time when it may be conveniently ploughed under. The difficulties which follow the maturing of legume seed are often considerable. Mauritius beans continue to germinate for months after ploughing under, and the vines are very troublesome amongst the growing cane crop. Cowpea is readily controlled, but reports indicate that Poona pea also presents some difficulties if allowed to mature.

Legume Experimental Plots.

At the request of the Mackay District Canegrowers' Executive, a legume trial was set out on the Mackay Experiment Station during the past season. Four species were included in the experiment—Mauritius bean, cowpea, giant cowpea, and Poona pea. Three small plots of each were established, in order to add to the accuracy of the results. Careful observations were made of the habit and behaviour of the different species throughout the growing period, in order to determine to what extent each fulfilled the stipulated requirements of a satisfactory cover crop under these particular conditions. When each had attained its maximum growth, the crop was harvested and weighed. Samples were also dried and analysed in order to determine plant food values.

Good germinations were obtained of all but giant cowpea; the available seed of the latter appeared to be of poor quality, and therefore this legume was not considered in the final results. The following table brings out the essential features of the results of the trial:—

Crop	Weight of Green Crop per Acre.	Plant Food in Crop (lb. per Acre).		
		Nitrogen.	Phosphoric Acid.	Potash.
	Tons.			
Cowpea	9·3	81	18	46
Mauritius bean	7·0	126	24	41
Poona pea	9·8	114	27	69

It will be observed that the Poona pea produced the heaviest weight of crop; indeed, in every important respect this species proved superior to its competitors. It was the only crop which effectively covered the land; the remaining plots exhibited the appearance of a mixed grass and legume crop, with the former frequently predominating. The cowpea was seriously affected by the bean fly, while the Poona pea flourished in spite of parasitic infestation. Further, it is generally conceded that the growth period of cowpea is rather shorter than is desirable, attaining maximum development as it does in about ten weeks. In this respect the Poona pea again presents the advantage that it requires about three weeks longer to pod. The Mauritius bean displayed a retarded growth rate throughout the trial, and the age of the crop at harvesting was more than four months.

The plant food figures presented in the above table are worthy of special attention. It is usually found that of the nitrogen contained in a leguminous crop, about one-third is derived from the soil while two-thirds are directly due to the activity of the root-nodule microbes. Further, practically one-third of the total nitrogen is contained in the roots, while the remaining two-thirds are present in the aboveground portion of the plant. As the harvest results presented herewith refer only to the vines and leaves, it may be concluded that the figures given in the "Nitrogen" column of the table represent the net gain to the soil with respect to this plant food. Expressed in terms of the amount of sulphate of ammonia which would be necessary to supply this quantity of nitrogen, we find an average figure of almost 5 cwt. of this fertilizer. The cost of this material on the land would be in the neighbourhood of

£3. It is also seen that appreciable weights of phosphoric acid and potash are returned to the soil at the same time. Of course it must be emphasised that these plant foods were drawn from the soil supply, and therefore do not represent a gain to the land; but the provision in this way of an adequate supply of plant food in a form available to our plant crop of cane explains the fact that is often observed—that the cane crop following the ploughing under of a leguminous crop frequently does not exhibit a pronounced response to further additions of artificial manures. This statement does not hold for soils which exhibit a decided deficiency with respect to phosphates or potash, in which event provision should be made for a supplementary application of the appropriate manure as a drill dressing.

Again, it should be clearly understood that the beneficial influences of the legume crop can scarcely be detected in the ratoon crops, and care should be taken to see that the necessary fertilizer, supplying all three plant-food materials, is applied in amounts adequate for their requirements.

On the evidence of the above trial, the decided value of the Poona pea as a green manure crop in the Mackay area is clearly indicated; and growers are advised to test out this species in comparison with the customary cowpea. It should be emphasised that the results recorded herewith apply only to the particular environment under which the test was conducted, and it is not intended to suggest that Poona pea would prove superior to Mauritius bean in the humid areas of North Queensland. On the contrary, the short growing period of the former would be a serious objection where a cover crop is required for a longer period.

In conclusion, it should be remembered that legumes appreciate congenial soil conditions quite as well as any other crop, and any added effort which is expended in providing a favourable seed-bed will be reflected in the crop result. Further, the degree of thoroughness with which the land preparation is effected prior to green manuring, will have its reward in the ease with which the land may be reduced to a condition of good tilth in readiness for cane planting.

Plate 150.—Farm Horse Sires at the Brisbane Show.

PRODUCTION RECORDING.

List of cows officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society and The Jersey Cattle Society, production charts for which were compiled during the month of August, 1932 (273 days period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Blossom of Penrhos (365 days)	Mature	18,933·25	824·182	A. Sandilands, Wildash
Perfect 2nd of Rosenthal	Mature	10,589	475·209	S. Mitchell, Warwick
Freda 2nd of Morden	Mature	11,594·4	455·824	R. Mears, Toogoolawah
Rosebud 9th of Rosenthal	Mature	10,236	450·959	S. Mitchell, Warwick
Fussy's Choice 2nd of Coral Brae	Mature	11,290·75	445·377	Hemming Bros., Murray's Bridge
Beryl of French View (264 days)	Junior (4 years)	9,275·77	411·322	W. J. Barnes, Cedar Grove
Buttercup 2nd of Kingsdale	Junior (3 years)	7,452·8	300·959	T. Shuttlewood, Peachester
College Molly	Junior (3 years)	7,002·55	298·480	Queensland Agricultural High School and College, Gatton
Wunulla Charm 7th	Junior (3 years)	7,712·25	293·209	W. J. Barnes, Cedar Grove
Handsome 12th of Rosenthal	Senior (2 years)	6,617·75	278·487	S. Mitchell, Warwick
Greylands Sadie 2nd	Senior (2 years)	6,948	259·569	Hemmings Bros., Murray's Bridge
Beauty of Murray's Bridge	Junior (2 years)	7,770·5	315·852	Hemmings Bros., Murray's Bridge
Mona of Trevor Hill	Junior (2 years)	7,649·03	280·657	J. Hennessy, Ramsay
Handsome 13th of Rosenthal	Junior (2 years)	6,055·75	245·562	S. Mitchell, Warwick
Jewel of Trevor Hill	Junior (2 years)	6,701·78	245·242	J. Hennessy, Ramsay
Favourite of Loomhurst	Junior (2 years)	7,242·3	243·078	T. Shuttlewood, Peachester
JERSEYS.				
Primrose of Southport	Mature	6,376·9	377·716	R. J. Crawford, Inverlaw
Noble Ivy of Brooklands	Mature	7,217·25	394·795	Fowler and Sons, Coalstoun Lakes
College Rose	Senior (3 years)	5,403·8	299·707	Queensland Agricultural High School and College, Gatton
Ellerdale Vanillas Melba	Senior (3 years)	5,544	313·798	H. M. Thomason, Mt. Mee
Ellerdale Sue	Senior (3 years)	6,183·25	315·979	H. M. Thomason, Mt. Mee
Carnation Iris	Junior (3 years)	5,759·75	308·641	Spresser and Sons, Brassall
Yuruga Primrose (267 days)	Senior (2 years)	5,759	297·624	R. J. Crawford, Inverlaw
Rosevale Elderia	Senior (2 years)	5,393	297·871	H. F. Rowe, Kenilworth
Yimmin Society Lady	Senior (2 years)	5,289·55	275·668	R. A. Anderson, Yandina
Hamstead Beryl 3rd	Junior (2 years)	7,255·07	364·787	J. H. Roberts, Harristown

PRODUCTIVE CAPACITY OF THE DAIRY COW.

Only an actual test can determine the productive ability of a dairy cow. The truth of this is being continually proved, the disparity between the owner's estimate of his animal's productivity and the fact as revealed by the Babcock tester being in some cases very considerable indeed.

A personal instance, on the occasion of taking over a herd from its previous owner, was quoted by Mr. J. O'Meara, in the course of a paper read at the recent Cobargo conference of the Agricultural Bureau of New South Wales:—

> "The man in charge pointed out those he considered the best cows in the herd, and also pointed out several cows which he considered should be culled out for various reasons. At that time the herd had not been tested. Later on this herd (of sixty cows) was put under Government test, and it was remarkable that neither the owner of the herd, nor the man who worked there previously, nor myself could have placed the first few cows in their proper order as producers. In fact, the cow we placed No. 1 should have been No. 44, and our No. 2 was nineteenth on the list; of the two cows which were pointed out by the previous tenant as the top of the herd, one was seventeenth from the top, and the other one, which was recommended as a show milker, was in fifty-seventh place."

Such instances, pointed out the speaker, showed how useless it was to speak of a cow's ability except as proven by her test.

Answers to Correspondents.

Fencing Act Regulations.

Correspondent (Mount Walker, via Rosewood)—

Your letter was unsigned, otherwise you would have received a reply by post. No pamphlet dealing with the regulations of the Fencing Act has been published. Kindly state your difficulty fully, and an effort will be made to obtain the information you desire. It would be better, perhaps, if you consulted a local solicitor, who would probably be familiar with local circumstances and could offer you the best advice.

Tanning Marsupial Skins.

R.A.R. (The Summit)—

See notes on tanning marsupial and other skins on another page in this issue.

To several correspondents—Officers of the Dairy Branch advise as follows:—

Proved Dairy Sire.

The proof is in the production recorded by the daughters of a dairy sire. A record of an increase in the butter-fat production by daughters over their dams is the all-important factor in determining the value of a dairy bull. The pedigree of the dairy sire should be carefully examined and the production records of the females analysed before you interest yourself in the many aristocratic names that are included in some pedigrees, and which may be of little assistance to a breeder in the selection of a dairy sire to head his herd.

Use of a Young Bull.

Do not use the young bull until he is eighteen months old, when he can be bred to eight or ten females during the ensuing period of six months. When he reaches the age of two years, the number of females can be increased to fifteen.

Feeding Value of Corn Cobs and Cotton Hulls.

"Inquirer" (Brisbane)—

Cotton seed hulls have little feeding value and are not easily digested, but add bulk to a ration.

Ground corn cobs consist mostly of crude fibre, which is not easily digested. The nutritive value is relatively small. The ground maize and cob can be used in compiling a balanced ration. The cob fibre increases the bulk of the ration.

Selected from outward correspondence of Mr. C. T. White, F.L.S., Gonvernment Botanist.

Monkey Nut.

E.C. (Upper Mudgeeraba)—

The specimen is *Hicksbeachia pinnatifolia*, a nut tree closely allied to the Queensland Nut and moderately common in south-eastern Queensland and north-eastern New South Wales. The only local name we have heard applied to it in southern Queensland is Monkey Nut, but this is not very suitable. The name Red Nut or Rose Nut has been suggested for it.

It is an ornamental tree, but though the nuts are eaten they contain slight traces of a prussic acid yielding glucoside and, in consequence, might easily cause death though no cases have come under our notice. Nevertheless the danger is there.

We do not think the timber has any commercial value as we have never seen a large tree. So far as observed the trees are of somewhat palm-like growth about 20 feet high with a stem a few inches in diameter. We do not know if it would propagate from cuttings. However, it is worth while trying, though it is easily propagated from seed. Though ornamental it is scarcely big enough and leafy enough to be termed a shade tree.

Hexham Scent.

F.P.B. (Brisbane)—

The specimen is the Melilot or Hexham Scent (*Melilotus parviflora*). This plant resembles lucerne in some ways, and some years ago was boomed as a fodder under the name of King Island Melilot. It has some value for poor, sandy country where other leguminous fodders such as lucerne and clovers will not thrive. On richer ground it grows very strong, but stock seem to reject it. It is unsuited for dairy cattle as it gives a bad taint to milk and cream.

Tree Tobacco.

T.P. (Pickanjinnie)—

The specimen is the Tree Tobacco (*Nicotiana glauca*), a native of South America, now a naturalised weed in parts of Australia. It has been accused of being poisonous to stock at odd times though no deaths from it have come under notice in Queensland. In South Africa, however, it is fairly definitely stated that the green leaves are poisonous to ostriches. The plant has no commercial value as a tobacco.

Scrub Poison Tree.

A.A. (Upper Ulam, C.Q.).—

Your specimen is from the Scrub Poison Tree (*Excæcaria Dallachyana*). The milky sap of this tree causes extreme irritation if it reaches the eye. The green and milky parts of the tree are reputed to be poisonous to cattle. However, I think it is rather doubtful if the quantity of sap adhering to an axe head would be sufficient to cause the death of several animals. In dry times when green feed is very scarce stock may be tempted to eat the green parts of this plant, and poisoning may result.

A Common Vine.

M.D.O'D. (Gympie)—

The specimen is *Kennedya rubicunda*, a very common vine in coastal Queensland and not known to possess any harmful properties. It is sometimes called Sturt's Pea, but this name really belongs to a different plant, a native of the drier parts of Australia.

Swamp Grass *(Poa Aquatica).*

W.F.N.S. (Townsville)—

The specimen is not *Poa aquatica*, but is *Hymenachne amplexicaulis*, a native grass found in damp situations. We were very pleased to receive the specimen, as we have only had it twice before—once from the Barron River and once from the neighbourhood of Mackay. In addition to North Queensland, the grass is widely spread over the East Indies as far north as the Philippine Islands. For wet situations it should be valuable, though we have little information in regard to its fodder value. We do not think there is any chance of *Poa aquatica* doing well in any part of North Queensland, as conditions there are altogether too tropical. On the whole, we do not think that water plants of temperate regions can stand the continual warm temperature experienced in the waters of the tropics.

Leopard Tree. Western Rosewood. *(Botanical Study.)*

M.H. (Theodore)—

The specimens have been determined as follows:—

1. Leopard Tree, *Flindersia Strezleckiana*. The leaves of this tree make quite good fodder for stock, and are largely used in parts of Central Queensland in times of drought.
2. *Heterodendron oleæfolium*, commonly called Western Rosewood. This tree is also good fodder for stock, but contains a prussic-acid-yielding glucoside, and if eaten in quantity by stock, particularly on an empty stomach, may cause death. It is widely spread over the Australian States, and some trouble has been experienced with it in New South Wales. However, we have had no experience of its causing losses among stock in Queensland, though when tested the leaves often give a positive reaction for the poisonous glucoside.

We would be very pleased to name and report on any specimens you care to send from time to time. Each specimen should be numbered and a duplicate kept, so that names can be returned corresponding to numbers.

Specimens of insects should be forwarded to the Government Entomologist, Department of Agriculture and Stock, Brisbane, and he will give you full particulars.

There is no book dealing with Australian plants comparable with Leach's Australian bird book. There are several ordinary text-books of botany explaining terms, &c., such as Brewster and Le Plastrier's "Botany for Australian Secondary Schools," Dendy and Lucas's "Text Book of Botany," and our own "Elementary Text Book of Australian Forest Botany" (C. T. White). The "Queensland Flora," by the late F. M. Bailey, price 30s. per set of six volumes, contains descriptions of most Queensland plants, and, though somewhat technical, if you ever intended to take up seriously the study of Queensland plants, it would be as well for you to have the series.

A North Queensland Vine.

E.C.D. (Townsville)—

The specimen forwarded is *Faradaya splendida*, a native of North Queensland, and one of the most beautiful of our native climbers. The genus *Faradaya* commemorates M. Faraday, the well-known chemist, and consists of three or four species—one in Queensland, the others in Papua and the islands of the Pacific. This vine was used, and perhaps in some places still is, for poisoning fish by the aborigines. Dilute infusions of the plant used experimentally were found to be particularly potent. The active principle is a saponin.

Cress, Stagger Weed, Shepherd's Purse.

I.H. (Blackbutt)—

The specimens have been determined as follows:—

1. *Capsella Bursa-pastoris.* Shepherd's Purse.
2. *Senebiera didyma.* Bitter Cress or Water Cress. Both the above are common European weeds now naturalised in most warm temperate countries. Both plants, particularly No. 2, taint milk rather badly, otherwise they are quite useful fodders.
3. *Stachys arvensis.* Stagger Weed or Wild Mint. This plant has been definitely proved harmful to working horses or travelling stock, causing severe staggers or shivers. Ordinary paddock stock, however, seem unaffected by the plant, and the animals have to be excited for the symptoms to be produced. It is generally regarded as quite a useful fodder for dairy cattle.

Disposal of Brumbies.

H.S.—

Section 7 of "*The Diseases in Stock Amendment Act of* 1930" provides for the destruction, sale, or disposal of worthless, abandoned, or decrepit horses, commonly known as "brumbies." This section also provides for certain preliminary action, including advertising, before a muster can be made.

Salting and Pickling Meat.

H.A.P. (Flaxton)—

1. The carcase should be allowed to hang overnight, so that the meat shall be well set and all the animal heat gone out of it.
2. *Dry Salting.*—Thoroughly rub a quantity of dry salt into the meat; the following morning turn and rerub a further quantity, and repeat for a couple of days. This will tend to force out and effectually get rid of the blood, &c.
3. *Formula for Pickle.*—To every 10 gallons of water add 15 lb. of salt, 2 oz. of saltpetre, and if a sweet pickle is desired add one 2 lb. tin of treacle (this is for every 100 lb. of meat). Boil all the ingredients together, remove any scum or impurities which may arise, and when cold pour it over the meat, every part of which must be covered.

In every case the strength of pickle should be closely watched and maintained; 80 to 90 degrees on the salinometer (brine tester) is the most effective strength.

N.B.—Remember that pickle becomes reduced in strength during curing process on account of the meat taking up some of the salt, &c.; therefore, if the pickle is to be used again for curing purposes, it must be reboiled (every third day), not forgetting to remove all scum, &c., and finally brought up to its former strength by adding the necessary ingredients—that is, salt. Pickle for pumping purposes should always be kept separate.

Feterita as Fodder.

W.S. (Oakey)—

Feterita is grown for grain purposes, and is not of much value as fodder. Like all members of the sorghum family, it cannot be fed with safety when at an immature stage. When frosted it would be of very little value as stock food. It cannot be compared with Sudan grass or any of the panicum as a fodder.

You would be well advised if you want to grow sorghum to try saccaline or Sudan grass, the latter being very suitable for your district. Cultivation required is only the same as that for crops such as maize. Land should be well worked up to a depth of 8 or 9 inches.

Sorghum should be sown in drills 3 feet 6 inches apart. It is easier to harvest, and will not lodge so readily when sown in this way. The quantity of seed required is from 4 to 5 lb. an acre.

Sudan grass can be sown in drills about 2 feet 6 inches apart, or broadcast; 3 to 4 lb. an acre in drills and about 12 lb. broadcast.

Nut grass cannot be eradicated if the area is badly infested. If only small patches are prevalent these can be destroyed by digging a hole 2 to 3 feet deep and greater in circumference than that of the nut grass patch and filling the hole with wood burn. The heat thrown off will destroy any nuts which have not been removed during digging.

Usually when lucerne is fit to cut the crop is roughly two-thirds in flower. A fresh growth will also be noticed at the base of the plant. When this occurs the lucerne should be cut.

General Notes.

Staff Changes and Appointments.

The resignation of Mr. William Maggs, Inspector under the Diseases in Plants Acts, Stanthorpe, has been accepted, as tendered.

The Shire Clerk at Waterford, Mr. William Laughlin, has been appointed as Honorary Inspector of Stock.

Acting Sergeant D. MacDonald, of Mitchell, has been appointed also an Inspector under the Slaughtering Act.

Mr. E. R. Behne, Acting Assistant Technologist, has been appointed Assistant Technologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

A New Brooder Stove—Ten Hours Heat for Twopence.

A new departure in equipment that would appear to offer advantages to poultry farmers is the "Etna" sawdust stove. It was originally intended for house-warming purposes, but practical poultrymen quickly saw that it could be suitably adapted for use as a colony brooder stove. A trial was carried out in New South Wales by "Scout" of "Poultry," who makes the following statement in that journal:—

"The stove was placed on a concrete floor in a very large cellar, much colder than the rooms in which we usually breed. The circular edge of the hover was 6 inches from the floor all round, and the hover is 4 feet wide. The stove burns sawdust. An iron bucket container is used, which, when filled with sawdust, is placed within the stove. A wooden centre core or pin is fitted in position in the centre of the bucket, fitting into a hole at the bottom. Sawdust is then put into the bucket and pressed around the core with the hands. When full the centre core is lifted out, and now you have a bucket of sawdust with a hole down the centre, as if moulded.

"Under the stove is a small kindling box or draw chamber; pull this out and put in it a piece of rag with a little kerosene or methylated spirit on it; light it and push back the box and the stove lights, and you do not touch it again for from eight to twelve hours, according to the draught you permit to pass through the ventilator, which can be regulated. The burned sawdust leaves nothing but a small quantity of fine ash. The only smoke visible is for a short time in the early stages while the stove is lighting up. The flue carries this away.

"In the test case under review the stove was lighted up at a quarter to 10 o'clock, and at 10 a.m. the temperature was 65 degrees, at 10.20 a.m. 90, at 12.45 p.m. 100, at 2.45 p.m. 106, at 3.15 p.m. 100, at 4.45 p.m. 98, at 7.30 p.m. 95, at 11 p.m. 94. So that the stove burned for thirteen hours with ample heat, this temperature was taken about 6 inches from the inside of the hover edge."

The manufacturers, E. Sachs and Co., Pty., Ltd., advise that in many places sawdust can be obtained for nothing, at other places for 6d. per bag, so, apart from the small initial cost of purchasing the stove, the up-keep is very small.

There is very little change in temperature over the whole period that the stove is alight. It is very much cheaper to run, and sawdust is a very much cheaper form of fuel than kerosene or any other similar fuel.

After brooding is finished the stove can be used in the kitchen, or for that matter anywhere in the house, and the top plate can be used to fry, boil, or cook anything that can normally be cooked on the top of an ordinary stove. The top of the stove can be used for boiling the water used to make the mash, and it can also be used to warm up the room where incubation is taking place, thus reducing the amount of fuel necessary to keep the incubator at the correct temperature.

Sawdust is the best fuel and lasts longest, but rice or wheat hulls, fine wood shavings, or other dry material can be used.

The stove has a cast-iron top and bottom, with heavy wrought iron sides. The inside container is of 22-gauge sheet steel, and the stove is constructed to last for many years. The flue can be carried through an opening in the roof or a wall. The heat in the stove can be varied by means of the control lever on the side at the bottom.

For continual use, such as for colony brooding, two inside containers are necessary, the one taken out being too hot to handle.

The "Etna" sawdust stove and cover can also be obtained from any poultry accessory suppliers, including the Poultry Farmers' Co-operate Society, Limited, from any of whom further particulars may be obtained.

Broom Millett Board.

The only nominations received at the Department of Agriculture and Stock in connection with the annual election of two members on the Broom Millet Board were from the present members, Messrs. Hans Niemeyer, Hatton Vale, Laidley, and Erich Max Schneider, Binjour Plateau. The necessary steps will be taken to reappoint these persons for a further term of one year as from the 1st November.

Pineapple Levy Regulations.

Executive approval has been given to an amendment of the Pineapple Levy Regulations issued under the Fruit Marketing Organisation Acts on the 18th August last. These regulations empower the Committee of Direction of Fruit Marketing to make a levy on all pineapples marketed for the year ending 19th August, 1933, the proceeds of such levy to be expended in the interests of the pineapple section of the fruitgrowing industry of Queensland.

No provision, however, was made in these regulations for a levy on pineapples when sold loose, and the amendments approved to-day provide that in instances where pineapples are sold loose the levy shall be at the rate of ½d. (with a minimum of 1d.) for twenty-four Smooth Leaf pineapples or forty-two Rough or Ripley pineapples as being equivalent to a case of fresh pineapples.

Deeds Better than Words.

Rear-Admiral Evans's faith in men:—"Throughout the Empire we have great lawyers and University chancellors who steer the community clear of the shoals of misunderstanding on which it is so easy for any of us to get wrecked.

"Merchant princes I admire only for their ability and drive. Very few of them come within my ideal series. I think we should pay more attention to bishops and heads of the churches than we do.

"We are told that teachers are better than admirals. If a review of our lives were to come up before the great lawyers, bishops, and University chancellors that come within my ideal series, the examples of the admiral's life would be better, perhaps, than the precept of the teacher's. I think deeds are better than words."

Referring to the trip in the thirty-two-year-old sailing vessel that took 128 days to voyage from England to New Zealand, when they were on their way to the relief of Scott, Rear-Admiral Evans said it was on shipboard, amid the fury of the elements, that men got down to realities.

"The worst blackguards away from the pubs and backwaters of the ports show qualities that are admirable, and kindle some kind of affection in their fellow-creatures," he said. "A gale does more than anything to tighten the bonds of sympathy and understanding in a little ship's company, and danger, hard times, and privations often bring out the best in men.

"Our discipline in the navy is a wonderful thing born of self-help and mutual support. And there is no reason why this discipline of the sea should not extend to the cities, because it is a fine thing built up by thousands of men over several thousand years."

During the time he had been in Australia, Admiral Evans said that his education had been going on as far as the Australian Navy was concerned, he added, and he felt sure that if one of the Australian cruisers was taken to the Mediterranean it would be placed in the front line for cleanliness, sea-going, and fighting efficiency, good looks, and, above all, good manners, upon which good character was founded. They had seen Australian sailors in the streets, and he did not think they could recall ever having seein one of them guilty of misbehaviour. He had come to Australia to serve the Royal Australian Navy, and he had also taken every opportunity to see as much of Australia as possible.

Rural Topics.

No More Heavy, Fat Pigs.

Discussing the altered conditions on world's markets recently, the Senior Instructor in Pig Raising in the Queensland Department of Agriculture and Stock says that there is, nowadays, no profitable market in any part of the world for the heavy, overfat pigs so popular in former years. There is practically no profitable market for very heavy pigs, though in colder countries and in the far north of England there is still a good outlet for such, but the demand there is readily satisfied from local sources, and it does not provide a sufficient opening for Australia's heavy baconers.

The trade in beef dripping, suet, mutton fat, and in margarine has been developing at the expense of the lard trade, while the world-wide demand for smaller and more attractive joints of meat and cuts of bacon has, for all time, killed the market for heavy, fat joints and fat meat. The great variety of canned goods now so much advertised has also filled a long-felt want for convenient, appetising, and nutritious lunch and sandwich meats, and has done away with the one-time popular "junk of bread and fat pork" meal. The world's appetite has changed—and apparently changed for keeps; hence the farmer must change his methods and bring himself more up to date.

Climatic conditions in this country certainly favour this changed demand and favour the small, meaty joint and attractively-prepared luncheon menus.

Grazing Sudan Grass—Warning to Dairy Farmers.

Owing to a number of mortalities occurring during the 1931-32 season in cattle from grazing on Sudan grass, the New South Wales Department of Agriculture advises farmers to grow Japanese millet instead of Sudan grass for dairy stock.

Considerable investigation has recently been carried out in New South Wales in regard to mortalities in cattle grazing on Sudan grass. As a result it appears that danger of prussic acid poisoning may exist under certain conditions when cattle are grazed on this crop. This danger appears to be greater in the younger stages of growth of a normal crop, and cattle are possibly more likely to suffer when first placed on the crop than when they are accustomed to it. Greatest danger of grazing the young growth of Sudan grass occurs with young shoots formed during a drought period, or on young growth resulting from rain following a dry spell. The conditions which govern the amount of prussic acid formed are not clearly understood, but it is evident that great variation exists in different crops.

So far no mortalities have been reported amongst sheep grazing on Sudan grass.

Pig Raising in the North.

Though situate on the faraway Atherton Tableland in North Queensland, Mr. C. W. Roseblade, of Yungaburra, keeps in touch with Southern interests, and is an active member of the A.I.S. Cattle Society. His interests also include pig raising, and for many years he has been keenly interested in the better stock movement. He introduced the G.O.S. breed of pig to the Tableland, but found that the popular Tamworth Berkshire and Tamworth Poland China were better types from the factory point of view. Nowadays Mr. Roseblade is also largely interested in pasture improvement, in which he co-operates with Departmental officers.

Impressed with the possibilities of pig raising, Mr. J. E. Foxwell, of Kureen, via Cairns, North Queensland, has been associated with the pig-raising business for many years. He recently owned a crossbred sow. Her first litter was eleven, next one twelve; she then had fourteen pigs on the morning of one of the Melbourne Cup races, and afterwards had several especially satisfactory litters. Her smallest litter was ten, while she had fifty-eight pigs in five litters, all sired by the same boar. The sow was a wonderful breeder, and equally good as a suckler, while also being of a very prolific type.

Progressive and determined to make a success of farming, Mr. Chas. Waters, of Butcher's Creek, North Queensland, has been specially interested in the Duroc Jersey breed of pig. His first purchase, Mooroombin Gerty, farrowed ten in her first litter, and won first prize at the Malanda Show. She produced ten in her second litter, and fifteen in her third family, but owing to an attack of illness was unable to rear her family, care that devolved on Mrs. Waters, whose ability with the handling of bottle-fed pigs needs no emphasis. Mr. Waters cures his own bacon, and has quite a good reputation locally for bacon and hams. His herd of Jerseys is the pride of the farm, while more recently he has added to his purebred stock a very fine lot of Columbian Wyandotte poultry. On the eve of my visit a native tiger cat had visited the poultry yard and sucked the lifeblood from a number of prize birds, but Mr. Waters is not deterred and still continues on. He says his father taught him that bad luck should mostly be referred to as bad management, and that the best of luck in life usually follows on improved methods of management, control, and dealing.

Lice in Livestock.

The desirability of cleaning up lice on farm animals before hot weather sets in is emphasised by the Instructors in Pig Raising in the Department of Agriculture and Stock, Brisbane. In humid climates lice and worms breed freely and multiply practically at every season of the year, but they spread more rapidly during the cooler months of the year when pigs lie abed longer and live more of their time indoors. During the summer time the pigs are out in the open most of the time, and when water is available they spend a good deal of their time in it, where, of course, the lice do not have the same chance. They also roll in mud and in this way destroy thousands of lice. An important precaution is to see that all the animals are treated, including sucking pigs, and that the pens, yards, and paddocks are regularly swept or raked and all rubbish gathered in heaps and burned.

For actual treatment of lice, a good, reliable mixture may be prepared by mixing together ½ pint of benzine, pint of kerosene, and 7 pints of fish oil. If the animals are reasonably clean and free from accumulations of mud, and if the oil is applied per medium of cloth, brush, or spray, all lice touched will be killed. Treatment should be repeated in three days and again at regular intervals. With care and attention there will be little difficulty in keeping the pigs and piggeries free of these blood-sucking parasites.

An Old Prayer.

Here is an interesting old prayer in verse, which dates from the eighteenth century at least. It is of English origin, but its author is unknown. It is as appropriate to-day as when it was written, as a petition for help in living a happy, healthy, and useful life here on earth:—

Give me a good digestion, Lord, and also something to digest.
Give me a healthy body, Lord, with sense enough to keep it at its best.
Give me a healthy mind, good Lord, to keep the good and pure in sight,
Which, seeing sin, is not appalled but finds a way to set it right.
Give me a mind that is not bound, that does not whimper, whine, or sigh.
Don't let me worry overmuch about the fussy thing called I.
Give me a sense of humour, Lord; give me the grace to see a joke,
To get some happiness out of life and pass it on to other folk.

Points in Pig Feeding.

In the feeding of pigs three cardinal points must be observed. The pigs must be of a type required for local and export markets, which indicates that they must have breeding and quality; they must be well fed from birth to maturity on foods that will result in profit, and they must be kept under conditions favourable to development and freedom from disease. In selection for marketing, only the best and most even pigs should be picked out and despatched, the balance remaining should then be transferred to the fattening yard and be pushed on to maturity.—E. J. Shelton, Senior Instructor in Pig Raising.

Pig Ailments.

A very frequent cause of cough in pigs is intestinal parasites, possibly also lung worms, for both these forms of parasitic life infest pigs and cause them to become unthrifty. This condition often persists until the animals are five or six months old, when they appear to develop sufficient resistant powers to be able to throw off the effects and gradually pick up strength again.

Kidney worms are also a prolific cause of trouble in pigs, particularly as they are deeply seated in the fat surrounding the kidneys and other organs and in parts of the body other than but including the kidney fat. Worms are very prevalent in pigs, especially in the more humid parts of the North and in seasons characterised by heavy rainfall.

In addition to specific treatment for worms, it is essential that pig pens, yards, and paddocks be thoroughly cleaned up and all rubbish burned to a cinder on the spot. The yards and pens, especially the floors, need to be thoroughly cleaned up and a strong disinfectant be sprayed over the walls and into the crevices in the floor.

Pasture Improvement in the North.

In the far North of Queensland, many progressive farmers are finding that pasture improvement work pays handsome dividends. Such a one is Mr. W. Hastie, of Elswick Park, Atherton. Discussing paspalum, Mr. Hastie says that this wonder grass has come through a very severe winter with flying colours compared with all other local and introduced species. Of Kikuyu, he states it is a good grass and suitable for all kinds of stock, pigs and cattle doing especially well on it. Heavy frosts nipped the Kikuyu back as it did the panicum and other soft grasses, but immediately after winter and early spring rains the Kikuyu shot ahead and made wonderful growth. Of Russell River grass he has no good word to say, for he indicates that, whereas a few years ago it was boomed, and although largely self sown throughout the North, it is only good for about two months, and then dries off and will not stand winter conditions. Of Florida clover, he states it is growing wild, and once it enters it spoils a lucerne paddock, but pigs, and horses in particular, thrive on it, also bees. Its roots, 6 inches to 12 inches in the ground, provide great food for pigs. He adds that Townsville or wild lucerne is spreading in the North, and is already noticeable along the railway line around Atherton. Seed merchants in the North were recently advertising for seed for distribution purposes.

Wild Lucerne.

Wild lucerne, know in the North of Queensland as Townsville lucerne, is known by the botanic name of *Stylosanthis mucronata*. It is a native of tropical America, but is now widely spread as a naturalised alien in most tropical countries. Mr. C. T. White, Queensland Government Botanist, states that it has been established in North Queensland for a number of years, and has proved itself a valuable forage plant. An analysis made by the Agricultural Chemist showed it to approximate in food value to ordinary lucerne. As a general rule, stock prefer the plant when it is drying off or has been slightly wilted. It is not known to possess any poisonous properties, but, like other succulent forage, may easily cause bloat if eaten in any quantity, particularly on an empty stomach. Care should therefore be exercised in using it as a stock food.

Rural School Club Movement.

That the Home Project Movement in Queensland is creating widespread interest, and is proving of considerable value in the education of the farm girls and boys, is emphasised by the figures for the last year. In 1931, thirty pig clubs, with total membership of 153, were registered.

Other project clubs (including calf, poultry, agricultural, milk testing, and vocational) numbered 361, with a total membership of 3,027. Results generally were considered highly satisfactory, especially considering the unfavourable weather experienced during the year in many of the districts in which clubs have been formed.

Molasses as a Medicine for Pigs.

When visiting the farm of Mr. J. W. Whinfield, of Yungaburra, North Queensland, recently, and in discussing the use of molasses as a pig food, Mr. Whinfield mentioned that on his farm much success had followed the use of molasses, not only as an addition to other less nutritious pig foods, but as a medicine for ridding the pigs of stomach and intestinal worms. He stated that, due to the regular use of a proportion of molasses, his pigs are now quite free of intestinal parasites and have grown and developed very satisfactorily. He has found that the provision of roomy pig paddocks in which there is an abundance of paspalum, kikuyu, and prairie grass and clovers has been of great advantage, while his crops of sweet potatoes, corn, and cow cane have enabled him to supplement the supplies of skim milk and maintain a larger herd of pigs than would have otherwise been possible.

The First Law in Dairying.

So closely is hygiene related to quality in milk products, the habit of cleanliness should be the first law in dairying, and the fact that the farmer is supplying the raw milk market should be no reason for laxity in this connection if he recognises his obligations to the consumer. The following simple rules for hygienic milking are laid down in a departmental publication, which admits, however, that although they have been preached for many years and involve in practice little extra time and trouble, they are still far from generally observed.

The cow having been bailed or tied up, the milker should wipe the udder with a damp cloth; this is preferable to brushing, which only causes the dirt to float in the atmosphere and subsequently drop into the milk bucket. A separate cloth should be used by each milker, and should be kept thoroughly clean and sweet—a smelling cloth is a source of contamination. After the milking of each cow the milker should wash his hands in clean water and dry them; if this is not done there may be bacteria in the liquid on the hands that will gain access to the milk in the bucket. Where gravitation water is not available, a good plan is to have, say, two oil-drums, into each of which is fixed a small tap. These drums should be fixed to the posts or walls and filled up with water, a system of running water thus being installed. Very often one finds basins of water used, but as this is probably not changed during the whole milking operation, it becomes a thick soup, containing myriads of organisms, and therefore a source of contamination instead of benefit.

Dry milking versus wet milking is often a debated point, but the practice of drawing a little milk into the bucket and dipping the fingers therein is undoubtedly most insanitary. A good plan is to touch each teat with a little vaseline, which prevents friction and also prevents cracks on the teats.—A. and P. Notes, Department of Agriculture, N.S.W.

Cheap Oils are Expensive.

A note of warning to those motorists who have changed from some well-known brand of oil to a so-called "cheap" make in an endeavour to reduce running costs is worth while. That such an action is unwise and likely to defeat its object is certain. The actual saving in outlay for lubricating oil can, at most, be a matter of shillings per annum. The additional engine wear and higher petrol and oil consumption consequent upon the change will more than eat up the apparent saving. Instead of saving, the motorists may eventually be many pounds out of pocket. Serious risk of actual breakdown is ever present, and in the event of such misfortune an expenditure of several pounds would have to be made. Take as an instance the burning out of a big-end bearing, as the result of using a poor quality lubricating oil. Such a mishap would, in most cases, involve towing to the nearest garage, replacement of the bearing liners, and a fresh fill of oil, and would cost anything from £3 to £5, no allowance being made for consequent delays. A job of this nature would completely offset the saving of difference of cost between a good and poor quality oil over a period of some years.

The importance of quality in engine oil is fully realised by motor manufacturers, who invariably advise the use of the highest quality lubricants in their products. Where all factors are under definite control, as in the tests carried out by the well-known makers of lubricants, the greater economy of quality oils is proved every day. The discerning motorist will readily appreciate that "cheap" oils are "expensive" in the long run, the initial saving being completely offset by subsequent losses. Real economy as far as the lubrication of the engine is concerned consists of using a high quality oil such as Mobiloil in the manner specified by the maker of the car or of the oil.

Litter Weighing Nearly 1½ Tons.

According to Mr. W. J. Schwab, of the Animal Husbandry Extension Staff, Purdue University, Adon Mosser, of Adams County, won the Hoosier ton litter contest for 1931 with fourteen pigs that weighed 3,420 lb. when six months of age. Second and third in the contest were litters entered by Erwin F. Fuelling, of Allen County. One of these litters, thirteen pigs in number, weighed 2,892 lb., the other, twelve pigs weighed 2,832 lb. at 180 days of age. Three hundred and twenty farmers had litters entered for the contest. Of these sixty-four were qualified litters for gold medals with litters weighing 2,000 lb. or more at six months of age. Thirty litters qualified for silver medals by reaching weights between 1,800 and 2,000 lb.; ten litters qualified for bronze medals by reaching weights of from 1,600 to 1,800 lb.—"Hoard's Dairyman."

Potato Land.

Analysing in the course of a recent wireless address the facts that the potato-growing possibilities of New South Wales are as yet far from fully developed, and that on the average acre yield the return for the labour expended must in many cases approximate less than the basic wage, the special agricultural instructor engaged with vegetable production stated that three main factors were operating against the growth and welfare of the industry. The first was the use of inferior seed, the second was the practice of continual cropping without due regard to the maintenance of the organic content of the soil, and the third was inferior grading of the product.

With regard to the two firstmentioned, it was pointed out that the "good old days" of potato-growing, when the crop was raised on virgin land, at its maximum in regard to fertility, and the disease problem was practically non-existent, were past. The need for increasing the yield in order to lower the unit cost of production, on the other hand, was never more urgent than at present. A smaller area, better farmed, should be the individual grower's motto.

Weakness of One-crop Farming.

It would perhaps be wise if potato-growing were considered more in the light of a mixed farming undertaking, particularly in conjunction with stockraising, rather than as a one-crop farming venture. Occasional use of the land for fodder and grazing crops (particularly clover) would be found of great advantage in bringing about the production of higher yields of better quality tubers. The maintenance of a satisfactory organic content in the soil was a matter of prime importance in potato areas. There came a time on every farm when no new land was available, and ultimately every grower would be faced with the task of maintaining the fertility of his older lands.

The success of the potato crop on virgin areas could be largely attributed to the organic matter which they contained, brought about by the turning under of leaves, grass sod, &c. Such material, when it had decomposed, imparted to the soil a desirable texture, and also improved its water-holding capacity. On areas which had been continually cropped, without attention to green manuring or the application of farm manure, the organic content quickly became depleted, and packing of the soil, particularly after rain, became apparent. Soil in such a condition would not produce a satisfactory yield, especially if compaction took place shortly after planting.

A suitable rotation in Tableland districts would be hay or grain, followed by clover or peas, and then by potatoes.

In coastal areas, where dairying was carried on, ample animal manure was available for maintaining the proper balance of organic matter in the soil, and where floods were experienced the alluvial deposits were beneficial in this respect.

An Effective Rotation.

The advantage of maintaining the organic content of potato land is demonstrated by the achievement of Messrs. Conlon Bros., of Exeter, N.S.W., who have won the Southern District Championship potato-growing competition for the last two years. These growers attach much importance to green manuring. Their practice is to sow a crop of peas in the spring, pickings of these being generally completed by November, when the land is sown to Japanese millet. The millet does well during the summer months, and, besides acting as a smother crop for weeds, provides a large volume of greenstuff for turning under in the autumn. A winter fallow enables the soil to be brought into excellent condition in time for the planting of the potato crop. Where livestock figure in the grower's programme, the millet crop could be utilised as feed.—A. and P. Notes, N.S.W. Dept. of Agriculture.

The Bee's Big Job.

A single pound of honey represents the life work of 300 bees. If it were possible for a single bee to produce a pound of honey, she would have to work 365 days a year for eight years. To gather this much nectar she would have to travel 75,000 miles or three times around the world.

Pigs as Swimmers.

There is a widespread superstition that pigs cannot swim because they cut their throats with their sharp front hoofs. Men have been heard to declare that they have seen pigs swimming with a trail of blood behind them due to the injury described. A correspondent of the "Farmer and Stockbreeder" not only contradicts this theory but gives it as his experience that pigs not only are good swimmers but are the only farm animals that will swim for pleasure. He writes:—"When farming at Godstone I had a large deep pond in which in the hot weather the pigs made a regular practice of jumping in and swimming across to an easy landing place at the other side. They would then walk round and repeat the process. I have watched them doing this for an hour on end. Where I am now I have river meadows where I have kept pigs. The river is 15 feet to 20 feet wide and 5 feet to 8 feet deep, but it is no boundary for the pigs. During the recent hot weather they all started swimming and generally landed on the opposite bank. The Senior Instructor in Pig Raising, Mr. Shelton, believes pigs to be good swimmers, and would not risk a good crop of potatoes on the other side of the river if the pigs once "sensed" them. He has not heard of any racial suicide in pigs through indulgence in the natatorial art.

Correspondence Courses in Pig Raising.

After having perused the series of agricultural correspondence lessons, the Minister for Agriculture and Stock (Mr. F. W. Bulcock) thinks the course an admirable one. He said recently that he appreciated its value, particularly to young men who, through lack of finance and opportunity, were unable to benefit by a course at an agricultural college.

Though at present in its infancy and largely experimental, he said, the series of correspondence lessons in pig raising had been taken up enthusiastically by a number of junior farmers. One of the correspondence course students had written to say that, due in no small measure to the experience gained through this course of lessons, he had been placed in charge of an important stud of pigs. There were, to the instructor's knowledge, hundreds of young men who, through lack of finance and opportunity, were unable to benefit by a course at an agricultural college. Many more were situated at a great distance from central training schools, while others, graduates of the Home Projects Scheme, leaving or having left schools, would be prospective students of practical correspondence courses. The scheme, therefore, had a very fine objective, and he expressed his appreciation of the instructors' work.

The World's Wool—Empire Marketing Board Survey.

The leading position of Australia among the producers of the world's wool is clearly brought out in the wool survey which has just been issued by the Empire Marketing Board. The survey is a work of over 230 pages, published by H.M. Stationery Office, London, and priced at 2s. It estimates, country by country, the sheep population, and wool crop of the world. Australia, with over 103,000,000 sheep, is only equalled or surpassed by Russia. There are between 700,000,000 and 800,000,000 sheep in the world, a third of them in the British Empire. A census of the world production of wool shows Australia as the largest raw wool producer. Since 1924 Australia has provided a quarter of the world's wool, while the rest of the British Empire produces another quarter. The export trade and the trend of prices are next studied, and the survey also includes an account of the lesser animal fibres—mohair, cashmere, camel hair, alpaca, &c.

The survey concludes that a large part of the price fall since the war has been due to the rise in the value of money, but adds that, generally speaking, wool prices have fluctuated more rapidly than the general commodity index. People economise on woollen garments and make them last longer. Demand is elastic, but the supply of wool is inelastic, so increased demand should show itself at once in the price. No large stocks have been allowed to accumulate through efforts to maintain prices.

Russian wool is almost entirely carpet wool, and the Russians import finer wools. The United States imports carpet wools. Neither of these great producing areas is likely to become an important exporter of wool in the near future.

Tractor Farming.

Mr. G. A. Wallace, of Weja, read an interesting paper, from which the subjoined notes are taken detailing his experiences with tractors at the annual conference of the Dowling Sub-district Council of the Agricultural Bureau of New South Wales:—

As a means of reducing the costs of production incidental to wheat-growing, tractor-farming appealed to me five years ago. Realising that an expensive tractor, if unsuitable, would represent a heavy loss on outlay and depreciation, and not wishing to burden myself with the risk, a light tractor was purchased. The experience gained proved that certain operations could be performed expeditiously and with kerosene as a fuel, and the cost of working compared very favourably with horse-drawn teams. The drawback to the light tractor was that it could only accomplish the work of six horses, and on certain classes of work it was not altogether suitable, while for cropping a large area it was necessary to use a second team.

Several years' experience convinced me that a more powerful engine would serve my purpose and enable me to discard the second team. Due consideration was then given to the choice of a suitable engine strong enough for the work it was desired to perform, and as regards the class of fuel used. During the previous years kerosene as a fuel had provided a working basis as to costs per acre on certain operations, but I decided, on the point of economy, that an engine using a cheap heavy-grade fuel would do the work more cheaply than one using kerosene.

The tractor purchased easily does the work of a twelve-horse team, but its use has meant careful reorganisation of the cultural implements. Two combines, one 14-run and one 17-run, were sold and replaced with a 20-run, which means that there is a reduction of outlay and that only one machine has to be kept in repair instead of two.

Using semi-crude oil as fuel, which costs landed 1s. 0½d. per gallon against 1s. 8d. per gallon for kerosene, shows a very distinct saving. I have used only one drum of kerosene in two years, and I have been unable to notice any difference in the working of the engine between the two fuels, the semi-crude oil going just as far and giving as much power. In fact, I prefer the oil and am sure it is far better for the engine, as it is not so harsh. Ten hours' consumption of lubricating oil is about 1 gallon; the used oil is added daily to the fuel and does not have any detrimental effect. At times I have used waste sump oil at the rate of 1 gallon to 4 gallons of fuel, and I found the mixture quite suitable.

Sowing 800 acres with a 20-run combine, half sown dry and the other after rain, worked out as follows:—

	£	s.	d.
Fuel (300 gallons at 1s. 0½d.)	17	4	0
Oil	5	8	3
Grease	1	0	0
Petrol	0	17	6
	£24	9	9

The cost per acre was thus 7.35d.

Forty-five acres is the average daily area sown, and only one man is required to take out seed, superphosphate, &c., and drive the tractor. The one tractor does all the seeding and fallowing, and no labour at all is employed during these two periods.

The total cost for repairs for more than two years' work over 8,000 acres, as well as belt work, has been £13 made up as follows:—Piston rings, £1 5s.; repairs to magneto, £4; SK.F. bearing, £1; grease gun, £3; pulley, 6s.; spark plugs, 9s.; steering gear, £3; repairs to front axle, 10s. Repairs to magneto should have been gratis, as it was faulty at the start and has been free from trouble for eighteen months, and the steering gear trouble was caused by inexperience. The cost of repairs per acre was thus ⅜d. The engine is pulled down at present, and the repairs required to carry on for the next 1,000 acres are two piston rings at 9s. and lathe work £1.

The saving in labour, approximately £80 yearly, more than covers the estimated cost of annual repairs, which I originally put down at £30.

When operating a tractor the best results are obtained by running it as near to boiling point as possible. Some makers claim that their engine uses practically no water in the radiator, and, if so, it is doubtful if maximum results are obtained from the fuel, and it is worth trying out the engine under a higher temperature, which can be obtained by partially or fully covering the radiator. In my case it means two hours longer run out of a tank of fuel—an increase of 20 per cent.

To obviate the necessity of using a screen, except during very cold weather, the fan blades on the tractor I am using were shortened, but when doing this care must be taken to see that it is not overdone and the engine allowed to become too hot. An engine equipped with a water jet has an advantage, when fuel of a detonating nature is used, as the water prevents pre-ignition and minimises the formation of carbon. What carbon is formed is of a soft nature and easily disposed of. The amount of water used is not very large, and usually works out at about one drop to every eight revolutions of the engine.

I carry out all running repairs, pistons being drawn every 2 tons of fuel, carbon cleaned off, and the valves ground in. I find that it is far better to purchase tools for repair work than to pay mechanics to do the ordinary work. With a little study of the instruction book and ordinary care, the operator should be able to keep the engine in a high state of efficiency, as during rush periods valuable time would be lost waiting for an outside mechanic to do the work.

In summing up I would like to mention that I have not referred to the cost of working with horses, as I do not wish to enter into that at present. For years I used horses, and experience gained with the tractor has firmly convinced me that in my own particular case the tractor is by far the better proposition. The work can be done on time whether the weather is hot or cold, and a big advantage with the tractor is that when you cease work you are definitely finished.

The Preparation of a Good Seed-bed.

Mr. H. C. Stening, Chief Instructor of Agriculture, gave the following address on seed-bed preparation at the annual conference of the Dowling Sub district Council of the Agricultural Bureau of New South Wales:—

Many advantages result from fallowing, but it is not generally recognised that perhaps the most important is the production of a good seed-bed, and this should be the aim of the cultural operations. In the first place, a good seed-bed can be defined as soil which is free from weeds and growth of any kind, with a reasonably level surface, and possessing a surface mulch that is loose and dry to a uniform depth of 2 inches super-imposed upon a sub-surface layer which is finely pulverised, firmly compacted, and well charged with moisture. This sub-surface soil should be porous but not loose, firm but not consolidated, and air pockets and buried clods must be absent. It should be level on top and form a union with the unploughed soil. This condition increases the water-holding capacity of the soil, as well as its capillarity. It places the seed-bed in the best possible condition for the germination of the seed and the development of plant roots, and an even depth of sowing is permitted in moist, compacted soil, thus ensuring rapid and uniform germination, resulting in an even and vigorous crop. This rapid germination is of much greater importance than is generally realised, as it ensures a good start to the crop, which is half the battle in the production of high yields, and it assists the crop in resisting the ravages of weeds, fungous and insect pests.

In the case of fungous diseases, such as bunt and flag smut, the wheat plant is infected at the seedling stage, during the period from the beginning of germination to the point when the first green leaf is ready to appear. It stands to reason that the shorter this period is, or, in other words, the quicker the very early growth the greater chance there is of the crop escaping infection. If seed is in the ground for any length of time before germinating, there is a danger of it being attacked by wireworms, and it is usually at the young seedling stage that most damage is done by the wheat root grub, cutworms, and a new insect pest, the pea mite, which has made its appearance in some of the southern border districts this season. A crop which makes rapid growth in its early stages reduces the depredations of these insect pests to a minimum.

The methods which should be employed for the preparation of an ideal seed-bed will vary according to the nature of the soil and the rainfall of the district. The aim should be to provide for the complete compaction of the sub-surface soil before the sowing period, and the first essential is to commence fallowing early. As a general rule, the ploughing should start immediately sowing operations are completed, and every opportunity should be taken to proceed with the work when the land is in a suitable condition. An endeavour should be made to complete ploughing by the end of July.

Heavy soils which have a tendency to set should be ploughed comparatively deep, whereas light, sandy soils and those of a self-mulching nature, which are difficult to compact, require shallow ploughing, or in some cases a cultivation with the scarifier is sufficient. As rains are the most effective agent in compacting the soil, it follows that the less rain that is likely to fall on the fallow, the more shallow should the ploughing be.

Generally, the early-ploughed land may be allowed to remain in the comb during the winter months, but in the early spring there should be no delay in creating a soil mulch. A wide sweep of the harrows is invaluable for performing the first operation of forming a mulch with a minimum of delay, pulverising the soil and facilitating the subsequent operations with the cultivator. At the earliest opportunity, the harrowing should be followed with a cultivation to the full depth of the ploughing with a spring-tooth cultivator, which exerts a sifting action on the soil, combing the clods to the surface and allowing the fine soil to fall to the bottom and form a compacted layer below the surface.

The loose, dry mulch should be preserved to a depth of 3 inches up to harvest time and be reduced to a depth of 2 inches after harvest. For these shallow cultivations between harvest time and sowing period, the rigid-tine scarifier is the most satisfactory implement, for it is most effective in cultivating to a uniform shallow depth and in destroying weeds. Furthermore, it exerts a compressing action on the seed-bed, leaving a level top to the compacted surface.

Bacteria Detrimental to Dairying—Simple Precautions that Prevent Contamination.

There are many ways in which milk can become affected by organisms harmful to it, but much can be done by very simple precautions. This fact was strikingly illustrated by a case quoted recently in the "Agricultural Gazette" of New South Wales.

During the check grading of milk quality at a cheese factory, writes an officer of the Dairy Branch of the New South Wales Department, a batch of cheese proved to be badly infected with gas-producing bacteria, and the source of contamination was traced by means of the Wisconsin curd test to one supplier's milk. The usual corrective methods advocated for adoption on the farm failed to remedy matters, even when machine-milking was temporarily suspended to determine whether infection was coming from that source. As the trouble persisted, the officer concerned decided to submit the milk from each cow in the farmer's herd to the curd test, with the result that out of forty samples tested twelve cows only proved to be giving infected milk.

Observation of the cows' movements during the day revealed that they fed on the flats during the morning and from midday on they camped in one particular spot, under a tree on the hillside. This camping ground surrounding the tree had practically become a manure heap. Intestinal organisms, usually responsible for gassy curds, were evidently carried by the cows in the dust which adhered to their coats, udders, and in the ducts of the teats. Careful washing of the udders and stripping from each teat the first few drops of milk before attaching the machines to the cows proved successful in eliminating the trouble.

Similar sources of milk contamination by intestinal organisms which produce fermentation detrimental to cheese-making frequently occur, and, could be easily prevented if every dairy farmer adopted the simple practice of cleaning and wiping each cow's udder with a cloth wrung out of water containing some odourless germicide, followed by withdrawing and rejecting the first ductful of milk from the cow's udder before commencing to milk the cows by machines or hand.

In the case referred to, the additional precaution was taken of preventing the cows from resting on the camping ground for a few days until the surroundings were cleaned up, with the result that when a later visit was made by the dairy instructor a vigorous growth of grass had appeared.

When Dipping Sheep.

A convenient way of ascertaining the capacity of the bath when dipping sheep is to measure water into it from a tank of known capacity. First run into the bath, say, 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities, and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

FACTS ABOUT WHEAT.

In the year 1879, that is within the lifetime of many now living, the modern roller mill process of milling wheat was perfected. In this process the kernel is not ground, but is broken between rollers. The germ, bran, and coarse grades of flour are then mechanically separated. That part of the kernel, which has physical properties which make it crush between rollers so finely that it will pass through bolting cloth, is marketed as white flour. As a result of milling we obtain the different materials in the following proportions:—

	Per cent.
White flour	70
Sharps or middlings	14
Bran	14
Germ	1½ to 2

All the milling products except white flour are sold as "offal" and used to feed fowls and other animals.

The Staff of Life.

As a consequence of this the bread we eat is a very different food from the bread which was eaten by our forefathers. This is a very serious matter, for bread has long been considered the staff of life. Wheat has always been the king of grains, and is still the conquering cereal. At the present time we live very largely on white bread and other foods made from white flour. The whole wheat and genuine wholemeal flour are very rich in a substance absolutely necessary for life and health, known as Vitamin B. This vitamin is distributed in very different proportions in the products derived from the wheat grain. If we take the contents of Vitamin B in the germ to be 100 per cent., then that in the middlings in 50, in the bran 33, in the flour 0.

White bread and everything made of white flour contains very little or no Vitamin B, consequently a large number of people in this country are living on a diet that is deficient in Vitamin B, though it is not completely absent. For this reason they are poorly nourished, and easy subjects for disease. Constipation among them is almost universal. On this condition whole industries flourish, yet the evil grows no less, for none of these supposed remedies goes to its root; they are merely palliatives which sometimes give temporary relief. Fortunately it is now possible to obtain preparations of wheat embryo, and a heaped teaspoonful daily will, if persevered with, cure all whose bowels have not been so atrophied of muscular tissues that they cannot recover. There are two of these preparations (Bemax and Vita B), both good, but both expensive. Of bran there are also two good, but expensive preparations, but ordinary cooking bran, which can be obtained from your grocer, is just as good. This he sells for chicken food at 1½d. per lb. Taken fresh from a newly opened bag it may be quite good. But not being meant for human food it is not guaranteed to be clean. It may have lain on the floor and been contaminated by dogs, cats, rats, and other kinds of dirt. Your grocer can obtain for you clean bran direct from the miller for 3d. per lb., and this is within the reach of the poorest. When there is a large demand for it, no doubt clean bran will be procurable at half the price. The right quantity to take is a heaped tablespoonful daily mixed with any sort of food. It is best uncooked, but may be cooked in domestic biscuits, scones, puddings, and cakes. Nursing mothers should take two heaped tablespoonfuls. Those who can afford it may take wheat embryo in addition to the bran, but that is not necessary.

LAUNDRY TALES.

IT would be interesting to study the development of laundry processes, and so learn how much we benefit to-day by an understanding of that development. Dr. Weeks, writing on education, said "the purpose of education is to substitute learning by understanding for learning by experience." In that way we benefit by the experience of others and so save much time and energy. It is so with laundry work, which it is necessary for every housewife to know something about. It really makes the ordinary routine of household tasks much more interesting if we understand the scientific reasons why we adopt particular methods for our work.

The primitive worker knew nothing of soaps and soda as an aid to removing dirt, but depended on the action of running water and kneading and pounding. These methods are used in some countries to-day, thus demonstrating their lack of education. The washing is done in a stream usually, and the wet clothes are laid on a rock or board and pounded until the dirt is dislodged. These rough boards and stones were the first washing boards. Sometimes the worker uses a scrubbing brush to clean the clothes. Needless to say these methods are very bad for the material. Drying the clothes is done beside the stream spread on stones and bushes. The Chinese run bamboo poles through the legs and sleeves of the garments, and a careful worker will move the pole from one leg or sleeve to the other during the process of drying, by way of shaping the garment, which probably will not be ironed.

Housewifery Wisdom.

The wise housewife will study carefully the question of fabrics and so simplify her laundry problems. It is not generally realised what it is which constitutes the real difference between cotton and woollen materials. Cottons and linens are vegetable fibres, and are much tougher than materials of wool and silk, which are animal fibres. The vegetable fibres have a greater resistance to chemicals, friction, and heat, consequently soap may be used freely on them, rubbing will not injure them, and they may be boiled and starched and ironed, because the fibres are tough enough to allow this treatment. Slight degrees of scorch may be washed from either of these fabrics, or removed by laying the garment in the sunshine. If it is badly scorched, wet the garment first before laying it in the sunshine.

Wool and silk, the animal fibres, are sensitive to chemicals, to friction, and to heat. An understanding of their nature helps tremendously to successful cleansing. Woollen material seen under a microscope seems to have tiny overlapping scales. If the cloth is rubbed when wet, or put into water which is very hot, or ironed with a hot iron, these scales interlock, shortening the fibre, thus causing shrinkage. Silk does not shrink, but soap and heat discolours and injures the silk. Always use lukewarm water when washing wool or silk. The soap should be good and applied in solution; it should not be rubbed directly on to wool and silk. This soap solution can be made in any quantity and kept for use when needed. To make it, cut 1 lb. of good soap into shreds and add 4 quarts of cold water, and boil gently till thoroughly dissolved.

Washing Woollens.

For washing woollens have water of a tepid temperature, add enough soap solution to make good suds; wash the garments by a squeezing motion, and when the water is soiled change to another which is soapy and of the same heat as the first. To remove persistent spots of dirt rub some soap solution directly on the spot. Don't do any more lifting or pulling than necessary, especially with the knitted type of garment. A little borax in the last rinsing water will clear up the white woollens. Rinse all soapy water well out with plenty of clean tepid water. In the absence of a wringer woollens should be squeezed dry—do not wring by twisting. Knitted garments, such as sweaters or coats, should be laid on a pad in the sun to dry. The pad should be made of several thicknesses of bath towels, a folded sheet, or any absorbent material. A number of woollen garments should never be put into the water at one time. The washing of one should be completed, rinsed, and hung to dry as quickly as possible. Flannels should never be allowed to lie about after being washed, because they shrink, harden, and darken in colour if not immediately hung to dry. If the garments require ironing be sure and take them in before they are thoroughly dry. Fold them together evenly, so that they are ready for ironing. If they are just crumpled up anyhow, you have unnecessary creases, which make more labour when finishing off. However carefully the woollens have been washed it is necessary in order to prevent shrinkage and discolouration to pay the same careful attention to the ironing of the garment. The ironing of woollens is more like pressing than like regular ironing, as the fibre scorches so easily, and the heavy seams glaze under the pressure of the iron. The most necessary

thing is to study the heat of the iron, because, if wool is once scorched, it cannot be remedied; consequently, be sure the iron is not very hot. Many fine flannels are greatly improved if ironed on the wrong side. When ironing woollen garments on the right side, especially frocks or trousers, it is necessary to use a clean white cloth fairly well damped between the iron and material. If done without a cloth the face of the iron will leave glossy marks. Some very fine woollen materials, used for blouses and children's frocks, have a much better appearance if they are not hung out to dry. They require washing in the same careful way, need a thorough rinsing, and if there is no wringer a good shaking is useful to get as much moisture out of them as possible. If they are rolled in a clean towel for a short time and ironed on the wrong side, the result will be very satisfactory. When drying a woollen cap it is a good idea to fill the crown with a clean cloth, so that some of the moisture is absorbed and the correct shape of the cap is retained.

Soap and Civilisation.

Soap is considered to-day as an essential in every civilised community, and it is difficult to imagine how we could do without it. It has been said that "the civilisation of a nation is known by its soap bill," and we realise the truth of that saying when we read of the laundry methods of primitive people. Three things are noticeable when studying these methods—there are heaps and heaps of clothes to be washed, they depend on running cold water, and the extreme hardships of the work. The washing of the clothes is made a kind of festive occasion in some countries. Special seasons are set apart, generally, when the women are not busy working in the fields, or when the weather is suitable. Consequently the washing accumulates. All primitive washing is done in cold water, which, of course, makes their labours so much harder. In some countries, like China, the scarcity of fuel makes it almost impossible for the poor women to have hot water. I was looking at some pictures of women washing along the streams, and I realised how much labour and energy were required to work in that kneeling and bending position. The Italian women have a kind of kneeling box made, which they place in shallow water, thus getting a little closer to the water without getting wet.

After thinking a little of the difficulties which have been overcome, we can settle down to our own laundry work with a light heart, knowing how much we are going to benefit by education and the experience of others.

General Hints.

A few general hints on the usual weekly washing would probably be very helpful to some housewives who are not experienced in laundry work. Even when one does not do the actual work oneself, it is very necessary to know the best methods and so be able to direct others. It is most impotrant to have the clothes carefully sorted, so that fine cotton and linen articles are not washed with silk and woollen ones.

If there are any stains it is always advisable to remove them before washing. To remove ink and rust marks, which are quite an everyday occurrence, dissolve a small portion of oxalic acid in some boiling water and dip the stained part of the garment into it, when it will quickly disappear. If the article is of silk or coloured material, allow the solution to get fairly cool before applying. If the stains are on woollen garments, equal parts of citric acid and cream of tartar are very effective. Moisten the spot with warm water, and rub the powder well in, and when the stain is removed rinse well. For white cotton goods a little soda should be added to the first rinsing water to neutralise the acid, and for flannel and coloured garments the first rinsing water should contain a little soap.

When looking over the table linen, if you discover stains of tea, wine, fruit, medicine, and mildew, you will find this solution very useful for removing them: Pour 1 pint of boiling water on to two tablespoons of chloride of lime and a small lump of washing soda, stirring carefully till the lumps are dissolved. The mixture must stand till cool, and then be bottled and kept handy for use. When a stain will not come out with ordinary washing, apply a little of this solution on the spot before putting into the copper. Great care must be taken when using this solution that it does not come in contact with woollen or coloured garments.

Turpentine is very useful for removing tar and paint. Put a few drops of turpentine on the spot, and gently rub with a soft, clean cloth, commencing at the outer edge, and gradually working to the centre of the stain.

If fine or lacy garments need boiling in the copper with other clothes, it is wise to put them into a bag first, in order to protect them from the poking and lifting, when they could so easily be torn.

Have the copper water cold when putting in the clothes, and when once boiling allow it to boil for ten minutes. Clothes will go yellow if boiled for too long a time. A thorough rinsing is most important, and be very careful about the blue. Soft, spongy materials absorb the blue very readily, consequently use a very diluted blue water for them, as too much blue will permanently discolour the clothes.

When making the boiled starch add a few shreds of white wax, and the results will be better if the clothes are starched when the starch is still warm.

—E.S. in the "Sydney Morning Herald."

Farm Notes for November.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and if the soil is deficient in lime a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes it appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of

the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

CLIMATOLOGICAL TABLE—AUGUST, 1932.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Shade Temperature. Extremes. Date.	Shade Temperature. Extremes. Min.	Shade Temperature. Extremes. Date.	Rainfall. Total.	Rainfall. Wet Days.
	In.	Deg.	Deg.	Deg.	Date.	Deg.	Date.	Points.	
Coastal.									
Cooktown	30·07	79	65	83	30	55	10	72	6
Herberton	..	70	47	83	12	34	9	132	12
Rockhampton	30·16	77	58	86	31	40	2	11	3
Brisbane	30·19	71	50	80	31	41	16	38	3
Darling Downs.									
Dalby	30·19	70	40	80	11	26	17	40	2
Stanthorpe	..	63	32	73	25, 26	19	16	50	6
Toowoomba	..	64	42	76	11	28	16	78	2
Mid-interior.									
Georgetown	30·05	83	52	90	12, 31	39	9	Nil	..
Longreach	30·15	77	47	90	30	37	8, 1, 2	Nil	..
Mitchell	30·18	71	37	82	30	25	17	7	1
Western.									
Burketown	30·07	82	57	92	31	46	2	Nil	..
Boulia	30·12	78	50	91	29	39	15	Nil	..
Thargomindah	30·15	72	45	84	25	35	2	7	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of August, in the Agricultural Districts, together with Total Rainfall during August, 1932, and 1931 for Comparison.

Divisions and Stations.	Average Rainfall. Aug.	Average Rainfall. No. of Years' Records.	Total Rainfall. Aug., 1932.	Total Rainfall. Aug., 1931.
North Coast.	In.		In.	In.
Atherton	0·80	31	2·08	0·77
Cairns	1·69	50	3·55	1·15
Cardwell	1·25	60	1·01	0·52
Cooktown	1·24	56	0·72	0·66
Herberton	0·62	46	1·32	0·61
Ingham	1·42	40	1·41	0·23
Innisfail	4·93	51	4·10	2·57
Mossman Mill ..	1·21	19	2·54	1·10
Townsville	0·51	61	0	0·10
Central Coast.				
Ayr	0·57	45	0	0
Bowen	0·64	61	0·17	0·11
Charters Towers ..	0·55	50	0	0·01
Mackay	1·04	61	0·48	0·18
Proserpine	1·29	29	0·80	0·22
St. Lawrence ..	0·83	61	0	0·32
South Coast.				
Biggenden	1·08	33	0·22	0·18
Bundaberg	1·30	49	0·23	0·90
Brisbane	2·01	81	0·38	0·90
Caboolture	1·56	45	0·27	1·02
Childers	1·23	37	0·19	0·94
Crohamhurst ..	2·23	39	0·97	2·95
Esk	1·52	45	0	0·66
Gayndah	1·16	61	0	0·28
Gympie	1·74	62	1·24	0·62
Kilkivan	1·47	58	0·40	0·39
Maryborough ..	1·71	60	0·67	2·87
South Coast—continued—	In.		In.	In.
Nambour	1·86	36	0·90	1·65
Nanango	1·33	50	0·08	0·49
Rockhampton ..	0·95	45	0·11	0·20
Woodford	1·73	45	0·19	1·67
Darling Downs.				
Dalby	1·22	62	0·40	0·27
Emu Vale	1·14	36	0·12	0·05
Jimbour	1·18	44	0·17	0·30
Miles	1·14	47	0·11	0·06
Stanthorpe ..	1·80	59	0·50	0·72
Toowoomba ..	1·67	60	0·78	0·38
Warwick	1·49	67	0·15	0·23
Maranoa.				
Roma	0·94	58	0·05	0·02
State Farms, &c.				
Bungeworgorai ..	0·79	18	0·05	0
Gatton College ..	1·15	33	0·60	0·46
Gindie	0·67	23	0	0·54
Hermitage ..	1·26	26	..	0·15
Kairi	0·83	18	1·34	0·68
Mackay Sugar Experiment Station	0·90	35	0·35	0·04

J. H. HARTSHORN, Acting Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October, 1932.		November, 1932.		MOONRISE. Oct., 1932.	Nov., 1932.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·36	5·48	5·6	6·6	5·52	6·43
2	5·35	5·48	5·5	6·7	6·27	7·45
3	5·34	5·49	5·4	6·8	7·11	8·52
4	5·33	5·50	5·3	6·8	7·59	9·55
5	5·32	5·50	5·2	6·9	8·55	11·0
						p.m.
6	5·31	5·51	5·2	6·10	9·57	12·2
7	5·29	5·51	5·1	6·11	11·2	12·59
					p.m.	
8	5·28	5·52	5·0	6·12	12·6	1·55
9	5·27	5·52	5·0	6·13	1·10	2·47
10	5·26	5·53	4·59	6·13	2·7	3·40
11	5·25	5·53	4·59	6·14	3·5	4·33
12	5·24	5·54	4·58	6·15	3·59	5·27
13	5·23	5·54	4·58	6·16	4·52	6·23
14	5·22	5·55	4·57	6·16	5·43	7·17
15	5·21	5·55	4·57	6·17	6·40	8·12
16	5·20	5·56	4·56	6·18	7·35	9·4
17	5·19	5·56	4·56	6·19	8·29	9·55
18	5·18	5·57	4·56	6·20	9·23	10·42
19	5·17	5·58	4·55	6·21	10·17	11·28
20	5·16	5·58	4·55	6·22	11·10	12·0
21	5·15	5·59	4·55	6·23	11·59	..
					a.m.	a.m.
22	5·14	5·59	4·54	6·23	..	12·35
23	5·13	6·0	4·54	6·24	12·46	1·6
24	5·12	6·1	4·53	6·25	1·27	1·38
25	5·12	6·1	4·53	6·25	2·4	2·13
26	5·11	6·2	4·53	6·26	2·37	2·48
27	5·10	6·3	4·53	6·27	3·10	3·30
28	5·9	6·3	4·52	6·27	3·44	4·24
29	5·8	6·4	4·52	6·28	4·20	5·23
30	5·7	6·5	4·52	6·20	4·59	6·30
31	5·6	6·6	..	..	5·47	..

Phases of the Moon, Occultations, &c.

7 Oct.	☾ First Quarter	6 5 a.m.
14 ,,	○ Full Moon	11 18 p.m.
23 ,,	☽ Last Quarter	3 14 a.m.
30 ,,	● New Moon	12 56 a.m.

Perigee, 2nd October, at 3.18 a.m.
Apogee, 17th October, at 4.6 p.m.
Perigee, 31st October, at 12.18 p.m.

The Moon will be in Virgo on 1st and 2nd October, in Libra till the 4th, in Orphincus on the 5th, Sagittarius till the 8th, Capricornus till the 10th, Aquarius till the 13th, Pisces till the 15th, Aries till the 17th, Taurus till the 20th, Gemini till 22nd, Cancer till 24th, Leo till 27th, Virgo till the 29th, and in Libra till the 31st.

Mercury sets 5 minutes after the Sun on the 1st and 49 minutes after it on the 15th.

Venus rises at 3.24 a.m. on the 1st and at 3.20 a.m. on the 15th.

Mars rises at 2.34 a.m. on the 1st and at 2.8 a.m. on the 15th.

Jupiter rises at 4.23 a.m. on the 1st and at 3.37 a.m. on the 15th.

Saturn rises at 12.29 p.m. and sets at 2.1 a.m. on the 1st; on the 15th it rises at 11.37 a.m. and sets at 1.5 a.m.

Mercury will be in Virgo and Libra during October; Venus, in Leo, will pass into Virgo on the 26th; Mars will pass from Cancer into Leo and will be near Regulus, the brightest star in the Sickle, at the end of the month; Jupiter, in Leo, will reach the border line between Leo and Virgo by the 31st; Saturn will be in Capricornus, moving slowly eastward.

An hour before sunrise on the 20th it will be interesting to look for the planets Venus and Jupiter which will apparently be remarkably close together in the constellation Leo.

Mars will be in conjunction with the Moon on the 24th at 4 p.m., when it will form an interesting daylight spectacle for those using telescope or binoculars. The Moon, being in the last Quarter will be only half illuminated. Two days later almost the same circumstances will accompany the conjunction, at 4 p.m., of Jupiter and the Moon. The conjunction of Venus and the Moon, at 4 a.m. on the 27th, will also be worth observing.

The Southern Cross will reach position XII. at midday on the 1st, at 11 a.m. on the 15th, and at 10 a.m. on the 31st, and its lowest position VI. at midnight, and an hour earlier at 11 p.m. on the 15th, and at 10 p.m. on the 31st.

5 Nov.	☾ First Quarter	4 50 p.m.
13 ,,	○ Full Moon	5 28 p.m.
21 ,,	☽ Last Quarter	5 57 p.m.
28 ,,	● New Moon	10 43 a.m.

Apogee, 13th November at 8·6 p.m.
Perigee, 28th November at 12·36 a.m.

The occultation of Landa Aquarii, magnitude 3·8, will occur about 9 p.m. or later, according to the position of the observer. A telescope or binoculars will be required on account of the brightness of the Moon, making the star less distinct.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Town Lads for Land Jobs.

THE Senate of the University of Queensland has granted the Government the use of portions of the University lands at St. Lucia and Moggill for farm training for city boys. The Minister for Agriculture and Stock has expressed appreciation of the generosity and courtesy of the Senate of the University in making the land available. Already the Government had formulated a plan, he said, and would proceed to make the necessary alterations to put the scheme into operation early in the new year. An area up to eighty acres of good agricultural land suitable for cultivation was available, but he thought that area would be considerably in excess of the requirements for the scheme to train boys for the land. They would cultivate only sufficient for their needs. There was in addition a considerable area suitable for grazing purposes. It was not proposed to do any actual agricultural work at Moggill. Timber would be obtained from this area, and in this the boys would be instructed in methods of clearing, burning off, and making land suitable for ploughing. "Actually there will be two schemes put into operation on the area at St. Lucia, the use of which the Senate of the University of Queensland has granted to the Government for five years," said Mr. Bulcock. "One of these will be the training of boys for rural pursuits; the other the establishment of experimental agricultural plots."

In his 1931 report the Public Service Commissioner, Mr. J. D. Story, I.S.O., stated that one of the reductions which grieved him most was the reduction which almost closed the door of admission to the various sections of the State Service, and he observed that the closing of the Public Service avenues of employment had added greatly to the anxieties and difficulties of parents who have sons and daughters for whom to find employment. The rural industries had always interested him; consequently, the development of a type of education suitable for the rural industries had ever appealed to him. The initiating and launching of the rural school movement and the home project schemes were tangible evidence of his sympathy. Seeing that the door to Public Service employment was practically closed, his mind turned once again to the possibility of preparing town boys for land occupations and to his previous efforts in that direction.

In his report for the current year Mr. Story gives further consideration to the idea, and quotes from a previous review as follows:—

> Many metropolitan parents have sons whom they wish to settle on the land; lads who themselves wish to follow the occupations of the big outdoors. Even if these lads have finished the fifth class work by the age of thirteen, their parents very wisely think that they are too young to be taken from school and sent to farms to learn the work. The parents prefer that their boys should be kept for a while longer under parental control and receive some further schooling, but they desire that schooling to be preparatory in a measure to the country life. But if the boys go to secondary schools they receive much instruction which has not a direct bearing upon their prospective vocation; hence it is felt that a preparatory agricultural school is wanted to complete the scheme of educational organisation. The school must be within easy reach of Brisbane by rail, so that lads may be able to live at home and travel to and fro daily.

These remarks, Mr. Story points out, are as apposite in 1932 as when they were written. Progressive educational programmes are provided for the learned professions, commercial vocations, and industrial occupations, but similar facilities do not exist for the preparatory training of metropolitan lads for rural pursuits. Hence, the agricultural link is still missing. That link it is now proposed to forge, and it is not too much to hope that the establishment of a farm training centre at St. Lucia will not only be successful in bestowing definite benefit on town lads who look to country life as a career, but will have an important influence on agricultural development in Queensland.

Dairying in Queensland—A Great and Expanding Industry.

THE following points of general interest have been extracted from the annual report of the Under Secretary and Director of Marketing (Mr. E. Graham) to the Minister for Agriculture and Stock (Hon. Frank W. Bulcock):—

It is very gratifying to report another record year in dairy production. The output of the previous year was exceeded by 2,156,637 lb. The total output was 95,050,738 lb., as against 92,894,101 lb. for 1930-31.

Early seasonal conditions were favourable to high production, but this advantage was offset by the subsequent dry season, when the yield of milk diminished to a degree unknown in a normal summer. Otherwise, the increase in production would have been even greater. Seasonal conditions were not conducive to improvement in quality, but the maintenance of the previous high standard is evidence of sustained efficiency in face of conflicting circumstances. Dairy factory efficiency has also been maintained at a high level. Oversea realisation showed a sharp decline, while the home market was also affected by lower consumer incomes. The comparative stability of dairying has induced established farmers to increase their herds, and has attracted many others to the industry. The demand for dairy land has a tendency to increase values, and so create a risk of over-capitalisation, which would be detrimental to the industry. Dairying is rapidly becoming a major interest in the North, where large areas are suitable for its establishment and expansion. This development was mentioned in my last review, and still further progress has been made in the course of the year. Butter production on our tropical coast and northern tablelands is greatly on the increase. Its quality is unquestionable, as has been demonstrated by success in open competition, and it has a definite favourable influence on our export trade.

Cheese production, however, declined in volume as compared with the output of the previous year, and this is directly attributable to the subnormal seasonal conditions prevailing in districts which are our main sources of supply. The total out-turn was 11,006,663 lb. as against 13,642,237 lb. for 1930-31. The same circumstances affected quality, which did not reach the standard attained in the previous term.

Through modern breeding methods, carefully and intelligently practised, strains of dairy cattle, pure in inheritance for high production, can be developed, and under the guidance of the Department this is being done in Queensland. Success in dairying, of course, does not depend on breeding alone, but also on feeding and management, and departmental activities in this regard were constant throughout the year.

The system of herd-testing is gaining ground, farmers finding that this free service is of great advantage to them as a factor in economic dairying. They are realising its value in reducing costs of production, the necessity of which, in face

of lower price levels for their products, they cannot afford to disregard. They are finding out that rigorous culling of low-producing cows is a profitable practice, and is an essential point in successful dairy farm management.

The use of pure-bred sires of families of proved production is also becoming more general. Results are now observable in every dairying district. Many dairymen, too, are realising, though gradually, that poor cows, inferior sires, and inefficient methods of pasture and herd management are no longer tolerable economically.

Pasture improvement is another point in dairying practice that is receiving wider recognition. Our field grasses are the best and cheapest food for the milking cow, and in Queensland they constitute up to 80 per cent. of the food consumed by dairy cattle. The importance, therefore, of grassland management cannot be stressed too strongly.

The value of silage as supplementary stock food, especially in dry seasons on high-priced land, is also becoming more widely appreciated in practice, and results are evident in higher butter-fat returns.

Every endeavour has been made to place more prominently before dairy farmers the definite advantages accruing from the practice of systematical rotational grazing, fodder production and conservation, and improvement of pastures, both native and introduced. All three, obviously, increase the carrying capacity of the dairy farm, a factor which in these days of lowered prices, due to reduced consumer purchasing power and other causes, no practical man can afford to ignore. The number of stock per acre does not, of course, alone ensure dairying efficiency; it is the quality of the cows that counts. Therefore, methodical herd-testing is another dairying principle calling for more extensive application in practice and to which the Department directs attention continuously.

Dairying is one of our main exporting industries; its value in the economy of the Commonwealth is, consequently, very great, so efforts of the Dairy Branch are also concentrated continuously on raising the general standard of efficiency in the industry. Mechanical milking is another factor in the economics of dairy farming which is gaining steadily in favour. Rapid motor transport from districts remote from railways has contributed largely to the improved quality of dairy produce during recent years.

Juvenile project clubs in country schools are doing something to broaden the agricultural outlook, and the Department, in co-operation with the Department of Public Instruction, is assisting in fostering this movement. Prominent breeders of pure-bred stock have helped it materially, and the favourable attitude of parents of children engaged in club work is an acknowledgment of its value in rural life.

Fodder Conservation.

CLOSER attention is being given to the production of suitable fodders for dairy cattle. Many of these crops have, however, through stress of seasonal circumstances, been utilised by farmers in their early stages of growth.

The practice of systematic fodder conservation is extending. Silage, as an economic and convenient method of stock food storage, is becoming recognised more widely. Departmental effort is being directed consistently and (where farmers are willing and able to apply it in practice) satisfactorily towards the more general acceptance and application of this primary principle in agricultural economy. The common experience of seasonal adversity, throughout our dairying districts particularly, has had the effect of demonstrating the wisdom of making suitable and sufficient provision for the lean years that inevitably recur, and the value of which has been stressed repeatedly in previous reports.

Grass the Most Important Crop.

IN pasture improvement Mr. Graham reports good progress in the course of the year. Information on the subject is being sought to a much larger extent than hitherto. This increased interest he regards as evidence of a broader appreciation of the value of grass in our rural economy. Grass, after all, is the most important crop in the whole range of the State's production. In our grass lands we have a wonderful asset and a great inheritance. It is the best and cheapest of stock foods, and yet, through human perversity, it is the most abused. No country can make progress on worn-out pastures. The importance of grass in beef and butter making cannot be over-estimated, and the growing disposition to conserve and improve our pastures, both indigenous and introduced, is most commendable. Farmers are showing a general tendency, so far as our grazing resources are concerned, to look upon their ownership not as a license to impoverish the land, but rather as an obligation to preserve its full fruitfulness.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XXXI.

Sugar Experiment Stations—concluded.

UP to 1924 the Bureau of Sugar Experiment Stations had not been able to give as much help to the industry in Soil Science, Pathology, Entomology, and Sugar Mill Technology, as it had hoped to do. This was largely due to the difficulty in securing trained men.

A start had been made with entomological problems as far back as 1911, as mentioned in the previous article—insect pests at that time and for some years thereafter being considered as causing the most serious damage the canegrower had to contend with. It had long been the chief aim of the present Director to acquire a trained scientific staff who would prove of value to the industry, and in 1922 he made certain suggestions to the Department of Agriculture for the appointment of a highly qualified Sugar Technologist to advise the sugar mills on manufacture, and also the appointment of a Sugar Cane Pathologist. Efforts were made in 1923 to obtain the services of a suitable man in Australia to take up the work of pathology in relation to sugar-cane, and when that failed the Department tried abroad, but there was a shortage of trained men available in the sugar countries of the world to supply the want. It was then recognised that the sugar industry would have to train its own men, and, fortunately, just about this time the late Chief Justice McCawley, who was a Senator of the Queensland University, made a suggestion to the Minister for Agriculture that out of the Cane Prices Fund three 3-year scholarships for selected University graduates should be awarded, with about £300 a year, the holders to undertake to work in the sugar industry of Queensland for at least three, perhaps five, years on completion of their course.

This letter was referred to the Director of the Bureau of Sugar Experiment Stations who quickly recognised the advantage that would accrue to the Bureau if he could secure these men when trained. He therefore recommended:—

> That the three students should not all take up the same lines of study while abroad, but that one student should be trained in Sugar Technology, one in soil and field problems, and one in plant pathology with special reference to cane diseases, the influence of climate and soils upon such diseases, and a study of bacteriology in connection with same. Such men would be of great value to the State and could at once be absorbed on the staff of the Bureau of Sugar Experiment Stations where difficulty was continually being experienced in obtaining trained scientific men. About the same time it was suggested by the Director that it would be wiser to allow the students to obtain twelve months' acquaintance with the sugar industry in Queensland, so that they would have some knowledge of local problems and some training in sugar matters before leaving Australia. These suggestions were approved by the Cabinet and various other interested bodies.

Conditions were drawn up, approved of by the Cabinet, and a Selection Board appointed consisting of the Public Service Commissioner, the Chairman of the Faculty of Science of the University, and the Director of Sugar Experiment Stations. An advertisement calling for applicants for these Travelling Research Scholarships was inserted in the papers, and fifteen applications were received. Each selector had a list of the applicants and their qualifications before him, and each selected the same three, namely—Messrs. H. W. Kerr for soils, A. F. Bell for Plant Pathology, and N. Bennett for Sugar Mill Technology.

After gaining some experience in Queensland in 1924, the students appointed left Australia and returned in 1928.

In the meantime, arrangements were made with the Queensland University to train cadets for entomological and pathological requirements, the Department of Agriculture paying these cadets an allowance on condition that they signed an agreement to remain in the service of the Bureau of Sugar Experiment Stations for a period of years after their training. In order that information might be obtained regarding the incidence of cane diseases, Mr. W. Cottrell Dormer (who is now assistant Pathologist) was appointed in 1924 to make a survey of the sugar-cane areas for disease. He subsequently attended the University and qualified for his degree with honours.

In 1928 the three Research Scholars returned with high credentials, and joined the staff of the Experiment Stations.

In 1929 the work of the Bureau was entirely reorganised and four divisions were instituted, with the officers mentioned in charge:—

Division of Soils and Agriculture—Dr. H. W. Kerr, Soils Chemist;

Division of Pathology—Mr. A. F. Bell, Sugar Pathologist;

Division of Entomology—Mr. E. Jarvis, Entomologist;

Division of Sugar Mill Technology—Mr. N. Bennett, Sugar Technologist.

Thus the specially trained officers were placed in charge of their respective divisions with the Director as administrative chief of the Bureau.

In 1912 the official staff of the Bureau consisted of only seven men. To-day it embraces twenty, as under:—

Director and administrative officers	3
Soils and Agricultural Division	10
Pathological Division	2
Entomological Division	4
Mill Technology Division	1

It is now proposed to give an outline of the work of each of these divisions.

Division of Soils and Agriculture.

In the reorganisation of this division at the outset, careful attention was given to provide adequate laboratory accommodation for the carrying out of the research work, and new chemical laboratories were

constructed in Brisbane. These were up to date in every respect, and the equipment permits of the study of practically any problem which it is found desirable to take in hand.

The Division of Soils and Agriculture has as its duties the full field experimental investigations of fertilizer requirements of the various soil types, the yielding capacity of new cane varieties, and the value of specific cultural treatments in increasing yields. The breeding of new varieties is an important phase of the work, which is receiving increasing attention.

Regarding the determination of fertilizer response on cane soils, it should be stated at the outset that the situation is a complex one. There is no other country where cane is cultivated successfully under such a wide range of climatic and soil conditions. The rainfall in the sugar belt ranges from excessively high to values where irrigation is essential for the growth of the crop; the temperature varies from tropical to sub-tropical, and the soil types are equally comparable in the magnitude of their variation. In considering fertilizer requirements, all of these factors enter. Consequently, it is necessary to set out fertility experiments on a large number of farms to determine the exact fertilizer required for each set of local conditions. The fact that sugar production in this country is carried on under the small-farm system further complicates the issue. In countries like Java and Hawaii, large proprietary companies operate both plantation and factory, and the work is supervised by a mere handful of agriculturists. In Queensland the number of suppliers is about 7,300, and the difficulties in dealing with each individually will be apparent.

However, it must be said that the results of this work justify the attention which has been paid to it. The experimental station results serve as a basis for the farm tests. These experimental blocks consist in general of twenty-five plots each one-twelfth to one-twenty-fifth of an acre in area, and five different fertilizer treatments are laid down. The system of experimentation is the latest approved method developed in recent years at Rothamsted, England. It can be claimed that the standard of accuracy of the results is superior to that of any other cane-growing country. Each of the plots must receive individual treatment and supervision; and, further, the whole plot must be carried through for at least three successive crops, in order to get a true measure of the fertilizer response.

At the present time about ninety farm experiments are under way in the various cane districts of Queensland. They are set out and supervised directly by the field officers of the Bureau.

Hand in hand with the field work goes the laboratory analyses of the soil types under examination, in order to determine the relationship between the field results and soil composition.

The question of securing the most suitable cane varieties for a particular set of conditions has been a very important one, and much attention is devoted to this aspect of the work. The large numbers of new canes imported from overseas have been subjected to yield trials against the old standard varieties, and those showing promise have been distributed amongst growers. The question of climatic and soil variation again enters into the issue; the leading varieties of

North Queensland being quite unsuited to Southern conditions, and vice versa. A very marked improvement in the quality and yielding power of the present-day varieties is observed. The legislation which governs the purchase of cane on its sugar content has been a great incentive towards the growing of sweeter cane, and it can be claimed that the sugar yield from a ton of cane in Queensland is now very much higher than that of any other cane-growing country. This point is well brought out in the following table:—

Year.	Acres Crushed.	Tons of Cane per acre.	Tons of Sugar per acre.	Total Tons of Cane Produced.	Total Tons of Raw Sugar Produced. 94 net titre.	Tons Cane Required to make 1 ton Sugar.
1900	72,651	11·68	1·20	848,328	86,631	10·09
1931	233,304	17·29	2·49	4,034,300	581,276	6·94

It is shown in the above table that, while the acres of cane crushed have slightly more than trebled, the production of sugar is now nearly seven times as great as in 1900.

During the past twelve years the breeding of new varieties suited to Queensland conditions has been pursued at the South Johnstone Experiment Station.

With a realisation of the value of disease-resistant varieties, the breeding programme has been revised during the past four years. Arrangements were made for the importation of a selection of the best breeding canes from Java, and these were used for the first time in cross pollination. It is hoped in this way to combine the disease-resistant qualities and vigorous-growing characteristics of the Java canes with the best qualities of Queensland standard varieties.

Cane seedling propagation has also been added to the activities of the Mackay and Bundaberg Stations, and it is trusted that canes especially adapted to the local conditions of these important centres will be produced.

All varieties of promise are subjected to rigid farm trial, after the manner in which we test fertilizers. When they have definitely proved themselves they are distributed for further planting.

An extension service has been built up, for the purpose of interpreting the scientific results into practical terms, for the assistance and guidance of growers. At present four field officers are employed in this service. Each is adequately equipped to travel throughout his territory, answering calls from farmers and giving desired information on sugar-cane agriculture in general. In addition, these officers advise on methods of disease and pest control, and are directly responsible for the laying out, supervision, and harvesting of all farm experimental plots.

Division of Pathology.

As previously mentioned the question of cane diseases was a serious one, and the considerable degree of ignorance in these matters made it imperative to secure the services of a competent pathologist. Queensland was in the unenviable position of having present a greater number of the serious diseases of sugar-cane than any other cane-growing

country. Up till the close of the past century the knowledge of the cause and nature of sugar-cane diseases was very meagre, and consequently it was not possible for the authorities of the day to frame adequate regulations to prevent the introduction of diseases and pests. Unfortunately, by that time nearly all the serious diseases of cane were present in this country; on the other hand many countries (Cuba, for example) had escaped with at most one serious disease. The presence of so many diseases of cane in Australia is attributable to the fact that sugar-cane has been grown commercially from latitude 30 to latitude 16. In this belt there exists a wide range of climatic conditions which practically cover the entire range under which sugar-cane is grown throughout the world. The early planters imported varieties from nearly every sugar-cane country, with the inevitable result that practically every serious disease was imported also. The presence of these diseases has been a very important factor in retarding the progres of the industry.

Records show that various individuals and commissions investigated the question of sugar-cane diseases from the very early days of cane culture, but the first sustained investigations in Australia were made in the nineties by Cobb (N.S.W.) and Tryon (Q'land), and later by Mr. D. S. North of the Colonial Sugar Refining Company. The present Director recognised the need for the services of a Pathologist specialising in sugar-cane diseases, and efforts were made to secure a suitable man for the position, but without success. It was therefore decided, in 1923, as previously mentioned, to send a Queensland graduate abroad for the necessary training to enable him to fill the position of Pathologist. In the meantime students were recruited from the Queensland University, and these were engaged upon a disease survey of the sugar belt. Upon the return of the Pathologist from abroad the Division of Pathology was created, and the following year laboratories were erected in Brisbane.

The following are the most important cane diseases found in Queensland:—gumming, leaf-scald, Fiji, mosaic, downy mildew, red rot, and red stripe. Of these the most serious is gumming; but, fortunately, it is confined almost entirely to the South, as is Fiji disease. Leaf-scald and red stripe are of importance in the North, while mosaic and downy mildew are found throughout the State, but are serious only in scattered localities.

There have been two serious epidemics of sugar-cane diseases in the history of the Queensland industry, viz.:—the so-called "rust" in the seventies, and gumming disease in the nineties. The disease known as rust was very imperfectly described by the early investigators, and it is impossible to say whether this disease was the true rust or not. Certainly the descriptions as given do not in the least resemble any of the present major diseases. Both this disease and the gumming disease of the nineties were slowly brought under control by the gradual substitution of other varieties. At the present day, gumming disease is again epidemic in the Southern district, while leaf-scald is wide-spread in the Northern district.

Under the small-farm system obtaining in Queensland, where the farmer has naturally not the time to specialise, the control of diseases presents a problem which is incomparably more difficult than it would be under the plantation system of cane culture, and almost the sole line of attack lies in the production of resistant varieties. Consequently the most important work of the Division of Pathology lies in

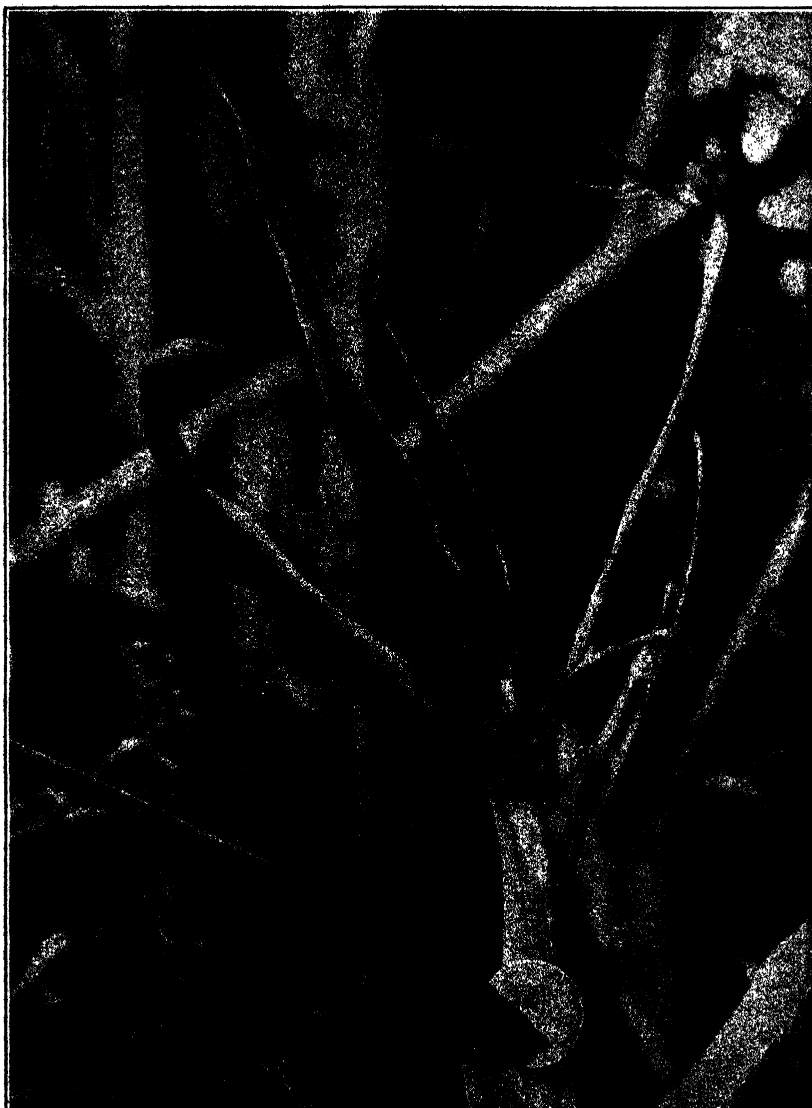


PLATE 151.—Typical Symptoms—Fiji Disease.

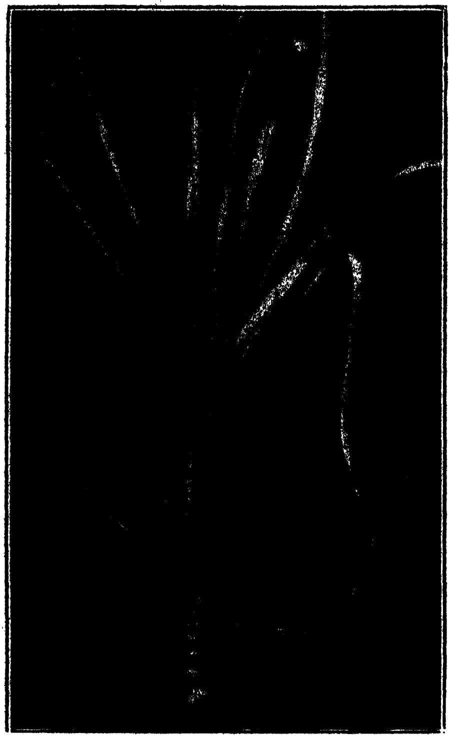


PLATE 152.—*Leaf Scald.* One-year-old diseased Mahona showing the typical etiolated, withered, and curled-in leaves of cane top, as well as the production of side shoots.

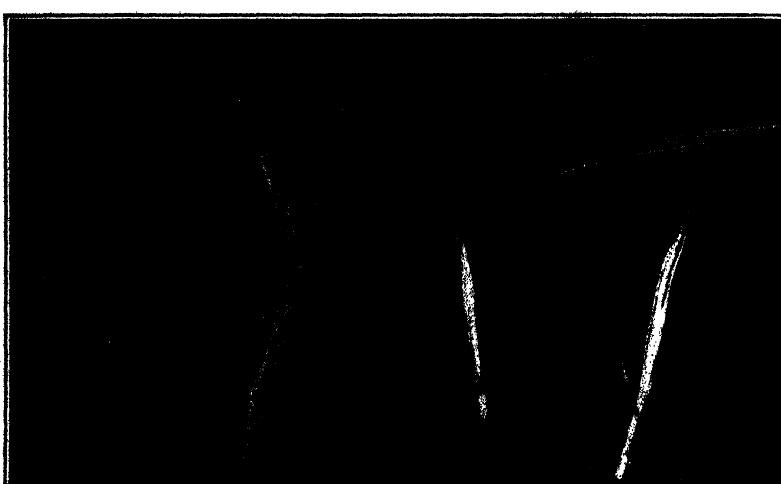
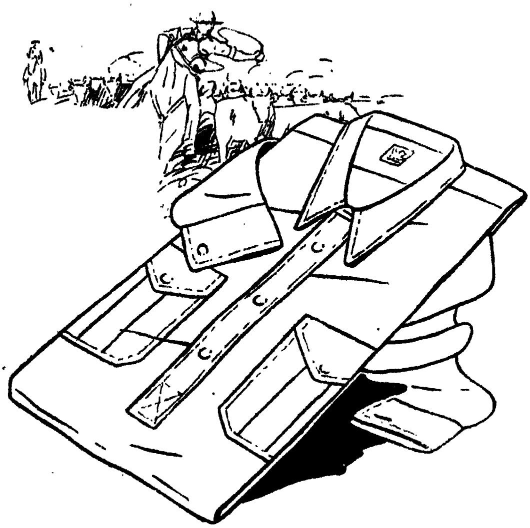


PLATE 153.—*Leaf Scald.* On right, feeble chlorotic shoots commonly arising when infected sets are planted. The fourth leaf of the plant second from the left bears a characteristic fine white pencil streak.



the conducting of field resistance trials. Seedlings are now being raised in each of the three main districts and will be tested for their reaction to any important diseases to which they are likely to be exposed, and only those varieties which exhibit a satisfactory degree of resistance will be propagated and distributed. By this means it is expected that the major diseases will eventually be controlled automatically. At present resistance trials are being conducted in connection with gumming, leaf-scald, red stripe, mosaic, and Fiji diseases. To date the main attention has been focussed on gumming disease, and during the past three years trials aggregating about 250 varieties have been conducted. As a result of these trials a number of highly resistant varieties have been developed, and the prospects for the complete control of this disease in the near future are very bright. Leaf-scald will now receive the chief attention, and at present approximately 1,000 varieties are being tested for scald resistance to determine their suitability for commercial propagation or as breeding canes.

As a result of the low economic value of the individual sugar-cane plant, and the extent of present knowledge, the question of a "cure" for cane diseases cannot be entertained, and control must lie wholly in prevention. The methods of prevention available are:—

(1) Quarantine;

(2) The growing of resistant varieties;

(3) The use of disease-free plants;

(4) Field sanitation.

These methods are briefly summarised hereunder:—

(1) Quarantine is of two types, foreign and local. Foreign quarantine deals with varieties introduced from abroad. These are now grown in isolation for a year, under the supervision of the Bureau, before being utilised.

Fortunately, the distribution of diseases is not general, and to minimise the likelihood of further spread into new areas, seven local quarantine districts have been created. The interchange of cane between these districts is prohibited, except by permission of the Bureau.

(2) The growing of resistant varieties has already been referred to.

(3) The use of disease-free plants.—The services of the Bureau's officers are at the disposal of farmers in their selection of cane for planting. In addition, in the areas where the disease situation is worst, the farmers' organisations have sought the aid of the Bureau in establishing isolated nursery plots for the supply of disease-free plants. This sound scheme, which has the full approval of the Bureau, has now been undertaken in three districts.

(4) Field sanitation.—This includes all farm practices, such as uprooting and destruction of diseased plants where necessary, burning of trash and rubbish liable to harbour disease, eradication of weeds, adequate drainage, &c.

Full details concerning the diagnosis and control of some forty cane diseases are set out in the handbook, "A Key for the Field Identification of Sugar-cane Diseases." It should be mentioned that this

publication, which was prepared by the Pathologist to the Queensland Bureau of Sugar Experiment Stations, is accepted throughout the world as the standard work on sugar-cane diseases.

Division of Entomology.

Of particular importance are the insect pests of cane, and these are the subject of the special attention of the Division of Entomology. Entomological laboratories have been established in the three main divisions of the sugar belt, and here a continuous search is made for cheaper and more efficient methods of control of pests. The division is greatly aided in its extension activities by the Cane Pests Boards, a number of which have a field representative appointed for the purpose of instructing farmers in methods of control.

The outstanding insect pests are the grubs of the greyback beetle, a beetle known as Frenchi, and the Childers cane beetle. There are certain features of these pests which require emphasis. They are indigenous to Australia, and consequently the possibilities of control by introducing a parasite from abroad are not promising. Having been established in Australia before the introduction of cane, they have other host plants, and thus their extermination is impossible. There is no way in which a farmer can escape the visitations of the beetles which fly into the fields and deposit their eggs at the base of the cane stool. The greyback beetle is possibly the worst pest of sugar-cane in the world, and annually causes losses in North Queensland of upwards of £100,000.

The grubs voraciously attack the roots, ultimately causing the cane stool to lose its hold in the ground and fall over. As the greater part of this damage is done before the mills commence crushing, the cane dies and becomes a total loss. As a result of research on the part of the Bureau, several methods of attack have been developed, the most successful being the use of the chemical fumigants, carbon-bisulphide and paradichlorobenzene. A census is taken of the number of grubs per stool of cane in order to determine whether the damage is likely to be such as to warrant the expense of fumigation. Should this be the case, the fumigant is then injected at the base of the cane stool. Unfortunately, this method of control is costly, and hence cannot be used unless the degree of infestation is high.

An important phase of the activities of the Division of Entomology is the search for natural enemies of cane pests. This method of control is particularly desirable on account of the small cost involved. A notable success in this direction has been attained in the control of the weevil borer, by the introduction from New Guinea of the parasitic Tachinid fly. These flies are bred in large numbers in special cages by the Bureau at Meringa, and are liberated in infected fields, upon the application of growers.

Other important insect pests which have been the subject of investigation by the Division of Entomology are wire worms, army worms, moth borers, grasshoppers, and white ants. The habits and life histories of these insects have been determined, and methods of control evolved in each case. All relevant information concerning these and other insect pests is made available to farmers in the form of bulletins, pamphlets,

and newspaper reports. These are all summarised in Bulletin No. 3, "Notes on Insects Damaging Sugar-cane in Queensland," written by the Entomologist to the Bureau of Sugar Experiment Stations.

It is estimated in addition to the work of the Bureau of Sugar Experiment Stations in combating cane pests that a sum of more than £50,000 has been expended by the Cane Pests Boards and Committees during the last seven years in the destruction of pests attacking sugar-cane. The greater part of this money is directly contributed by the sugar industry itself.

The first entomological laboratory, which was situated at Gordonvale, consisted of a large six-roomed building rented by the Department of Agriculture for this purpose, lying within a stone's throw of the Mulgrave Central Sugar Mill.

Being practically surrounded closely by canefields, the site offered an ideal spot from which to carry out entomological research work. By the end of six years, however, increased activities in connection with the control of cane insects, together with the necessity for providing accommodation for a resident entomologist and assistants, and a better equipped laboratory, led to the establishment by the Bureau of an Experiment Station at Meringa.

The spot selected for such purpose was a portion of the Recreation Reserve, about 13 miles from the city of Cairns, a tropical part of the State, situated within 18 deg. south of the equator, and having an average rainfall of about 92 in.; while the minimum and maximum temperatures range respectively from 68·4 to 83·7 deg. Fahr.

Entomological Laboratory at Bundaberg.

Up to 1926 little had been done in establishing the identity or means of control of any of the more important insect pests in the canefields of Southern Queensland.

It was known that "white grubs" were a serious problem in some districts, and short visits had been paid to parts of the affected areas by different entomologists in order to collect material, and compare infestation and habits of these pests with the "greyback" cockchafer in North Queensland. These visits and investigations were, however, spasmodic, and owing to the greyback problem being a more important and urgent one, work was concentrated on this pest to the almost total neglect of the Southern pests.

The Southern sugar districts consist of Bundaberg, Gin Gin, Isis, Maryborough, Pialba, Bauple, Nambour, and Beenleigh, and these were included in the territory wherein it was proposed to proceed with these investigations. A survey of the districts was first undertaken, and it was soon evident that "white grubs" were the most serious insect problem in the South, and, furthermore, that there were several species involved. The districts most adversely affected by these pests were Isis, Gin Gin, and Bundaberg. Pests of minor importance were for the most part found in the other districts, and owing to the prevalence of certain serious sugar-cane diseases there, their possible importance in the role of vectors of these diseases could not be overlooked.

PLATE 154.—Entomological Laboratory at Meringa.

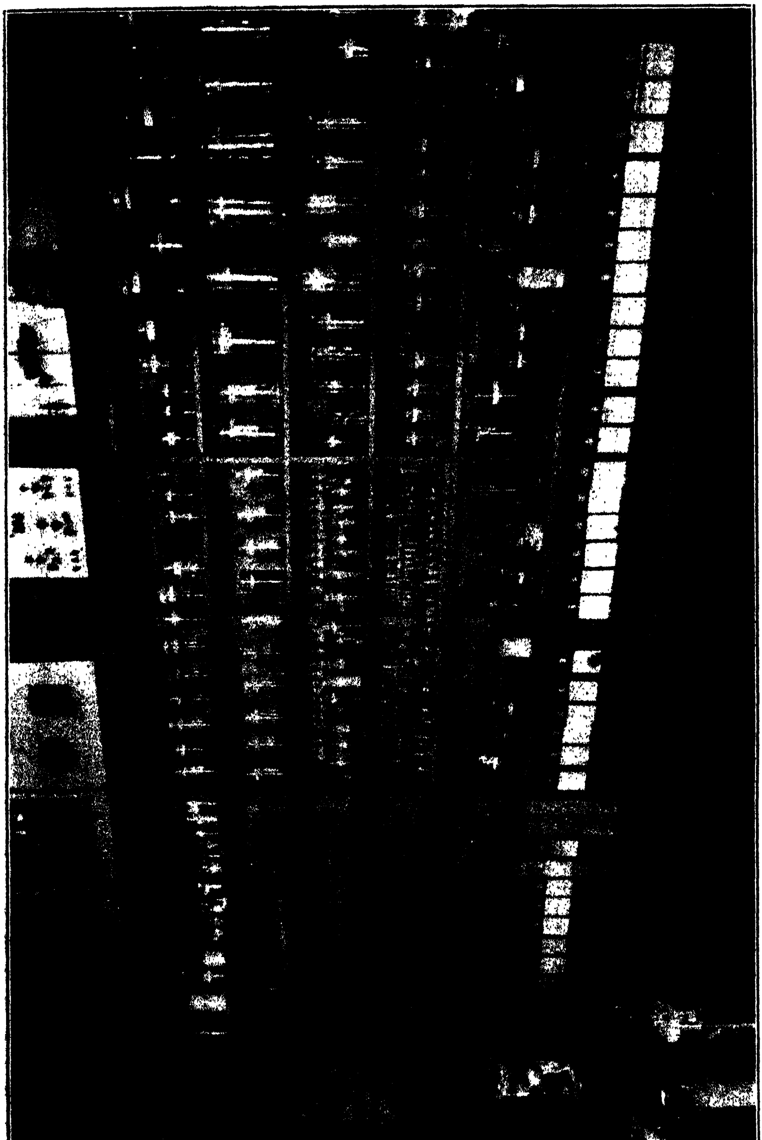


PLATE 155.—Entomological Museum at Meringa.

Soon after this survey work was completed, a laboratory was established at Bundaberg and fitted out with the necessary equipment for carrying out entomological investigations. In addition a reference collection has gradually been built up, and preserved specimens of most cane pests and parasites are on view, for the information of growers and others interested in this particular branch of the Bureau's activity, and they may obtain advice on all pests connected with the growing of sugar-cane.

Work was first commenced on establishing the identity and working out details in connection with the life histories of these "white grubs" previously referred to. It was found that two years were required for their complete development and they included the following species:—*Pseudoholophylla furfuracea* Burm., *Lepidiota trichosterna* Lea, and *Lepidiota frenchi* Blkb.

P. furfuracea was found to be the most important pest, and infestation was worst on the red volcanic soils, the areas which originally supported dense scrub vegetation. Next in importance came *Lepidiota frenchi* and *L. trichosterna*, the "frenchi" grub being a pest chiefly on forest lands.

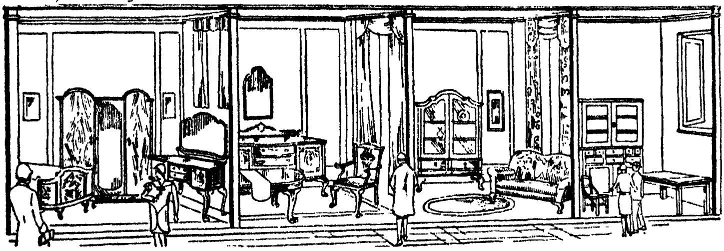
Control measures have been worked out, and these aim in so regulating planting and giving attention to correct cultural operations that conditions are made unfavourable for the wholesale development of the pests. Where pests are established in growing crops, soil fumigation is necessary, and a soil fumigant has been evolved which gives a high percentage of mortality. By co-operating with the local Farmers' Associations it has become possible to supply to growers troubled with these pests fumigants at cost price, and injectors are also loaned out at a nominal rental. At the same time they are instructed in the method of applying this fumigant, and every encouragement is given them to clean up their damaged areas and thereby prevent further trouble being stored up for them in the future.

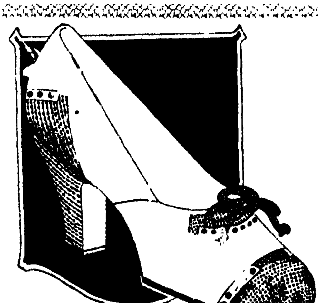
In former years, it was thought by growers generally that a high degree of control was gained by the collection and destruction of beetles of the species of *P. furfuracea*, which had been attracted to light traps and collected therefrom. These beetles were paid for by a Pest Destruction Fund at the rate of 1s. 6d. per quart, and the money expended yearly in this connection was considerable. Investigations by the Bureau showed that approximately only 1 per cent. of those caught at light traps were females and the control gained thereby was negligible, and on the recommendations of the Bureau payment for this species of beetle was abandoned.

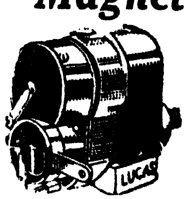
In the early stages of investigations, it was realised that the weevil borer *Rhabdocnemis obscurus* had not become established in the South, and no real danger from this pest existed, so long as no importations of cane plants were made from North Queensland. Accordingly, inter-district quarantines were established by the Pathologist, and proclamations were made prohibiting the introduction of canes beyond certain boundaries without a certificate giving them a clean bill of health. In this way it is hoped to effectively keep this pest out of Southern districts.

Entomological Laboratory at Mackay.

In January, 1928, an Assistant Entomologist was sent to Mackay and a laboratory provided for his work, which, so far, has been chiefly in connection with the wireworm damage to cane.



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Cane Pests Boards.

Sugar-cane is a sweet succulent plant and is naturally the prey of many insect and animal pests. During the past thirty years pest committees were instituted to deal with pests such as grubs, rats, &c., which committees were usually provided for by funds voluntarily subscribed by the local canegrowers and subsidised by the mills in the district, and to some extent by the Government. It was, however, felt that all farmers should be made to subscribe to these funds, and an attempt was made in 1916 to introduce legislation to that effect, but the amendments in the Bill made by the Legislative Council were not acceptable to the Assembly. At a later date—viz., in 1923—at the desire of representatives of the canegrowers, the Government of the day amended the Sugar Experiment Stations Act so as to provide for the constitution of Cane Pests Boards when a request for same was made by a majority of canegrowers in a district, and the making of a levy of not more than three pence on every ton of sugar-cane received at any sugar works within a cane-pest infested area, to be paid by the growers and millers in equal proportions. From this fund, which was to be administered by the various Cane Pests Boards, payment was to be made for the prevention and suppression of such animals, birds, and insects as were set forth in the regulations. These comprised:—

Animals—Rats, wallabies, mice, kangaroo rats, foxes, wild pigs.

Birds—Red bills or coots.

Insects—Cane beetles, cane grubs, moth borers, weevil borers, beetle borers, bud moths, plant bugs, wireworms, grasshoppers, locusts, army worms, set eaters, white ants, caterpillars, plant-eating beetles, leaf hoppers, plant lice, mealy bugs.

Up to date seven Cane Pests Boards have been constituted under "*The Sugar Experiment Stations Act Amendment Act of* 1923"—viz., Plane Creek, Mackay, Lower Burdekin, Ingham Line, Tully, South Johnstone, and Mossman.

Division of Sugar Mill Technology.

Early in the history of the Sugar Experiment Stations attempts were made to provide the Queensland sugar-mills with technical assistance, and Mr. J. C. Penny, who had been with the Sugar Experiment Station at Hawaii, carried out for a short time the duties of chemical Inspector of Sugar Mills, afterwards resigning on being appointed to the position of manager of Farleigh Mill. Subsequently Mr. J. C. Brünnich performed some work in this connection for the Bureau, but his services could not long be spared by the Agricultural Department.

The present Director, however, was anxious that the mills should have assistance and advice, and, as already pointed out, it was arranged that one of the travelling students should take up the study of sugar-mill technology, and as the graduate selected (Mr. Norman Bennett) had already had experience in Queensland sugar-mills, he left Queensland in 1924 and did not return till 1928. During that time he visited Java, Scotland, Louisiana, Cuba, Hawaii, and the Philippine Islands. Upon his return, the Division of Sugar Mill Technology was formally constituted within the Bureau of Sugar Experiment Stations.

Pending closer examination of the requirements of the Queensland mills, no further appointments were made at this early stage of the establishment of the Division, and Mr. Bennett's duties were defined in such a way as to advise and assist mill managers, mill engineers, and mill chemists in all stages of the manufacture and technology of sugar.

For the first season, 1928, the officer appointed visited all Queensland mills, with the exception of those of the Colonial Sugar Refining Company. As the result of this survey of the mills, the establishment of the Division was undertaken along the following lines:—

1. The establishment of a society independent of the Division which would arrange for periodical gatherings of Queensland Sugar Technologists for the purpose of discussing their problems.

2. The establishment within the Bureau of a system of standardisation for laboratory apparatus and technique.

3. The establishment within the Bureau of a system of mutual control for those Queensland mills who were willing to forward the results of mill-working periodically to the Division. The system to be adopted for this mutual control was elaborated by the technologists and submitted to a special committee of chemists appointed by the Queensland Society of Sugar Cane Technologists for ratification.

4. The establishment of a technical and research laboratory.

5. The appointment of a technical engineer and a technical chemist to assist the mills in the elucidation of their problems.

During the period which has elapsed since the inception of this work, the organisation of the Division has proceeded slowly but surely along the lines set out above. However, owing to financial difficulties, the appointment of a technical engineer and a research chemist has been delayed, and on the expiration of his agreement with the Government Mr. Norman Bennett resigned and took up the position of manager of Racecourse Sugar Mill. At the present time the staff of the Division consists of an assistant sugar-mill technologist and a librarian and clerk who is in charge of the mutual control scheme.

One of the chief difficulties with which this Division of the Bureau has to contend, and which will become more pronounced in future years, is the fact that the officers of this Division, after some years' experience, will be qualified to assume responsible positions in the industry outside the Bureau of Sugar Experiment Stations, and the Division must be prepared to lose specially-trained men to individual sections of the industry. The position is unfortunate, but it must be borne in mind that one object of this Division of the Bureau of Sugar Experiment Stations should be to train juniors and students for the outside work required by the industry.

The question of the utilisation of by-products is one that immediately concerns the Technology Division of the Bureau. At present, molasses is being used for the manufacture of power alcohol, which is being mixed with Shell benzene and having considerable success as an internal combustion fuel under the name of "Shellkol," and further factories for its manufacture will in all probability be erected. Other by-products such as building board and artificial silk manufacture have been under consideration. With regard to the former,

the establishment of a factory has been before the industry for about six years, but the price offered for bagasse is not commensurate with the value of the raw product to the mills as fuel. The sugar technologist pointed out that "the requirements of the Australian market for such materials as building board, artificial silk, industrial alcohol, and methylated spirits are limited. Actually, the problems of the utilisation of the by-products of the sugar industry are not technical, but are fundamentally economic. Before any extension of these secondary industries can take place a sure market must be developed for the finished articles."

General.

During the past twenty years thirty-two Bulletins on Agriculture, Pathology, and Entomology have been issued by the Bureau in addition to numerous circulars and leaflets.

The sum of £325,855 has been expended on experimental work since the inception of the Bureau of Sugar Experiment Stations in 1900. Its work in connection with the sugar industry cannot be over-estimated.

The Queensland Society of Sugar Cane Technologists.

In March, 1929, a conference of mill managers, mill engineers, and mill chemists was called in Mackay to discuss the problems dealing with the milling section only, and to consider the formation of a society of sugar technologists. At this conference, representatives of sixteen sugar-mills, six engineering firms, the Cane Prices Board, and the Bureau of Sugar Experiment Stations were present. After four days of particularly interesting discussion, the conference formally decided to establish a permanent body, to be known as the Queensland Society of Sugar Cane Technologists, and with the following objects:—

1. The promotion of discussion of technical problems of the Queensland sugar industry by annual conferences held in the sugar centres of Queensland.

2. The arrangement for the publication and distribution of technical literature on all matters dealing with cane sugar.

3. The affiliation and co-operation with the International Society of Sugar Cane Technologists.

The proceedings of this first conference of Sugar Mill Technologists was printed by the Bureau of Sugar Experiment Stations at the request of the newly-formed Society and distributed to all mill managers, mill engineers, and mill chemists. The first officers of the Society were—

President—Mr. W. F. Seymour Howe, General Manager of the Mulgrave Central Mill.

Honorary Secretary—Mr. Norman Bennett, Sugar Technologist to the Bureau of Sugar Experiment Stations.

Executive—Mr. H. S. Goldsmith, General Manager of Walkers Limited; Mr. W. Pollock, Chief Engineer of the Tully Central Mill, representing sugar-mill engineers; Mr. C. H. O' Brien, Chief Chemist, Mossman Central Mill; and Mr. M. A. Doolan, Chief Chemist of the Mulgrave Central Mill.

Commencing with a membership of forty, comprised chiefly of mill managers, engineers, and chemists, the scope of the Society's activities was widened to include all agricultural sections at the First Annual Conference held in Cairns in 1930. In 1931, the Second Annual Conference of the Society was held in Bundaberg and was attended by some 100 delegates from all sugar centres in Queensland, while in 1932 the Third Annual Conference was held in Mackay with an attendance of 108 delegates.

There are at the present time 257 members on the roll, comprising 155 full members and 102 associate members. The need for such a Society has now been generally recognised by the leaders of the sugar industry, and its work has received recognition outside Australia, prominence being given to extracts from papers in such leading sugar journals as "The International Sugar Journal" and "Facts about Sugar."

The President of the Society is now Mr. J. W. Inverarity, and Mr. J. M. MacGibbon is the Honorary General Secretary.

The Society is materially assisted in carrying out the objects for which it was formed, by the Queensland Cane Growers' Council and the Australian Sugar Producers' Association.

[THE END.]

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

The Northern Entomologist (Mr. E. Jarvis) has submitted the following hints for November to the Bureau of Sugar Experiment Stations:—

Grey-back cockchafers should make their appearance about the middle or end of this month, the date of such emergence corresponding with that of the first decided fall of rain. Unless the present dry conditions chance to continue throughout November and well into December we may expect a liberal occurrence of cane beetles. It is interesting to note, however, that the critical five months occupied by the pupal condition of our grey-back beetle have not proved too favourable to the normal development of this life-cycle stage, the rainfall registered at Meringa during the period in question having been less than 4 inches, whereas the average precipitation during these five months in the Cairns district (over the last forty years) is 9.87 inches.

During the present month (November) farmers should make a point of reading the notes on grub fumigation, which were published last July in the "Queensland Agricultural Journal" (Vol. xxxviii., pages 6 and 7); or in the "Australian Sugar Journal" (Vol. xxiv., page 175, July, 1932), as these notes will be found helpful to growers intending to fumigate their cane against grubs of the grey-back cockchafer.

Collecting Beetles from Feeding Trees.

Preparations should now be made for collecting cane beetles on plantations where feeding-trees of this insect happen to be conveniently situated, and can be used as trap trees. The "Weeping Fig," "Moreton Bay Ash," &c., are favourite food-plants, and generally attract most of the beetles in the vicinity of a canefield. When found growing close to headlands, it will be found a good plan to clear away the vegetation from under such trees to within a radius of a chain or two, in order to induce beetles to concentrate upon them, and to facilitate collecting from same.

Caterpillars of Moth-Borers of Cane.

Evidence of the presence of the "Large Moth-borer," together with indications of damage resulting from the attacks of larvæ of our smaller species of moth-borers will be noticed this month amongst young shoots of ratoon and plant cane. The so-called "dead hearts" caused by such mining caterpillars are due to destruction of the central heart-leaves, and during certain seasons are very conspicuous amongst young cane on low-lying river flats. The shoots of third ratoon crops are often injured by caterpillars of the "Tineid Moth-borer," the highest number of young shoots destroyed per stool being from ten to twenty. Control measures consist in cutting out the dead-hearts to a depth of about 2 inches below ground level, particularly those which are wilted but still slightly green or yellowish-green, as these shoots generally contain the caterpillar responsible for the damage, or its pupa. Needless to say, these should be crushed or otherwise destroyed.

Grasshoppers and Army Worms.

Canegrowers are asked to report to the Entomologist at Meringa any occurrences of the small hopper stage of such locusts as the Yellow-winged grasshopper, &c., which may chance to appear on their plantations, in order that this pest may be combated without delay while in its early wingless condition. Similarly, any serious infestation of cane by caterpillars of the "Army worm" should be promptly made known. Now is the time for overhauling spray pumps, and after cleaning same replacing defective washers, &c., by new ones. A supply of lead arsenate should be on hand; same is procurable at 1s. 6d. per lb. in 7-lb. tins, and 1s. 1½d. per lb. in a case of 112 lb. When spraying against leaf-eating caterpillars or beetles, use 1½ to 2 lb. arsenate in about 50 gallons of water.

In Memoriam.

HARRY TINNISWOOD EASTERBY.

BY the death of Mr. Harry T. Easterby, Director of the Bureau of Sugar Experiment Stations, the sugar industry has lost one of its most notable personalities and Queensland a fine citizen. Making a tour of the cane-growing districts, he was in the office of the Cairns Canegrowers' Association when he suffered a sudden seizure which terminated fatally on Wednesday, 28th September, so he practically died in harness.

An excellent administrator and a master of method, Mr. Easterby characteristically left everything in perfect order. For some time past he had been engaged in writing a history of the sugar industry, a work comprehensive in its scope, which on its publication in book form will be accepted as an authoritative survey and as a valuable record of the establishment and development of one of Australia's greatest agricultural enterprises. To him it was a labour of love and the last chapter was ready for the printer just before he left Brisbane on what was to be his final visit to the North.

Mr. Easterby's death is a distinct loss to the State which he loved and served so well; and also to the industry in which was bound up his life's work, and which he helped on its technical, scientific, and administrative sides to develop to the stage it has reached to-day. In fact, for many years he ploughed a lonely furrow, and on his shoulders rested the entire investigational work of the Bureau until in time it became possible to appoint an adequate staff. It is believed that the heavy work entailed in the organisation of the services of the Bureau, entailing as it often did actual hardships in the years when transport and other facilities were anything but modern, undermined a powerful physique to an extent that was largely the cause of his ultimate breakdown.

Great in heart and ability, big in achievement, firm and courageous in his convictions and rigid in honesty of purpose, he was regarded as a man among men. His thoughtful consideration of others, geniality of manner in all personal contacts, his capacity for inspiring the affection of his associates made of him an exemplar of what is best in humanity.

Harry T. Easterby was born at Echuca, Victoria, in 1867. He studied at the Horsham (Victoria) Public School, and applied himself to chemistry and microscopical science, including sugar chemistry, and subsequently entered the sugar factory at Maffra in 1897, where he studied the technology of sugar under Dr. Riesen. He was afterwards appointed to the position of chemist with Messrs. Gibson and Howes, owners of the Bingera Sugar Plantation at Bundaberg. Mr. Easterby was engaged later by the Victorian Government to make investigations into the beet sugar industry in 1900 and part of 1901, after which he was appointed Assistant Director of Sugar Experiment Stations in Queensland to Dr. Walter Maxwell. He subsequently became Director, which position he held up to the day of his death.

The Sugar Experiment Stations during Mr. Easterby's long term of office developed remarkably. At the time he joined the service there was only one station in Queensland. Now there are three; also three entomological laboratories, a sugar-cane pathological laboratory, a sugar soils laboratory, and a sugar mill technologists' laboratory; while the staff has increased from six to twenty-two, including chemists, pathologists, entomologists, and agriculturists; while the yield of sugar has increased from 120,858 tons in 1901 to 581,276 tons in 1931, and the tons of cane required to make 1 ton of 94 net titre sugar have been reduced from nearly 10 in 1901 to well under 7 during the past two seasons.

PLATE 156.
The Late HARRY T. EASTERBY.

In addition to his services as Director of the Bureau, Mr. Easterby's comprehensive knowledge had been availed of on different occasions in other directions. He was called on by the Victorian Government in 1915 to advise as to the future of the sugar beet industry in Victoria; had sat on three Royal Commissions connected with sugar, and in 1929 was one of the Queensland delegates at the Triennial Conference of the International Society of Sugar Cane Technologists, held in Java, and was vice-chairman of the Queensland section of that Society.

Few sugar men have had opportunities to apply themselves to a close and diligent study of both the cane and beet spheres of that industry, but Mr. Easterby was included in the select minority.

His keenness for his work, his unusual organising capacity, and his ability to win the confidence, co-operation, and sympathy of the growers and millers throughout the State, contributed in no small way to the success which attended his labours. A genuine desire to give of his very best permeated the man. His close application to the various problems with which he had to grapple, his perseverance and his immunity from discouragement through temporary checks, and the simple sincerity of the Director, soon won for him a place of esteem in the eyes of all growers and millers.

Mr. Easterby knew his cane growers, and the cane growers knew him. They understood one another, and a peculiar bond of appreciative sympathy existed between them.

As a regular contributor to these pages Mr. Easterby was well known to our readers. His record of the industry, the concluding chapter of which is published in this issue, will be accepted as an authoritative document, dealing as it does with the development of the industry in this State from every angle. There was, perhaps, no one more qualified that Mr. Easterby—by both long experience and active participation in every phase of the industry in field and factory—to undertake the task of compiling an authentic record of development and events that make up the story of one of Australia's greatest rural industries. It was a pathetic circumstance that with the end of his history of the Queensland sugar industry came the end of a life devoted almost exclusively to its interests and progress. By his share in the moulding of sugar policy he performed great service to Queensland. His personal influence on the sugar industry was pronounced and remains indelible.

Apart from his intense interest in agriculture and its problems, Mr. Easterby was a student of classical and modern literature, Shakespeare being his favourite among the moderns. Microscopy was another of his leisure-hour hobbies.

In the passing of Harry Easterby there has gone from among us a man who was not only a notable figure in the agricultural life of Queensland, but who, as a good Australian, had all those fine qualities of mind and character that win and hold the affections and deep respect of his fellow men. It can be truly said of him that he served well his day and generation, and his work for the sugar industry of Queensland will remain a lasting monument to a life spent largely in its service.

The late Mr. Easterby was laid to rest on 29th September in the Cairns Cemetery, after a short service at St. John's Anglican Church. Gathered around the graveside were his son, Mr. R. T. Easterby, and numerous representatives of the sugar industry, the Department of Agriculture and Stock, and every other section of the community. Many fine tributes to his worth and work were paid by the metropolitan and country Press and leading citizens, including the Premier, Hon. W. Forgan Smith, and the Minister for Agriculture and Stock, Hon. Frank W. Bulcock.

To the bereaved relatives deepest sympathy is extended.

THE FIJI DISEASE MENACE IN SOUTHERN QUEENSLAND.

By ARTHUR F. BELL, Pathologist.

OWING to the danger of Fiji disease becoming a serious menace to newly introduced varieties of sugar-cane in Southern Queensland, the following notes have been compiled in order to describe the symptoms by which the disease may be recognised; and to set out the methods by which it may be controlled.

Under suitable conditions Fiji disease can be one of the most destructive of all sugar-cane diseases. This disease takes its name from the country where it was first observed some twenty-five years ago, and most canegrowers will recall that for some years the sugar industry of Fiji was very seriously affected by the ravages of the disease. Fiji disease has been known in Southern Queensland for a number of years, and is widely distributed in the Maryborough and Beenleigh districts. By the exercise of the recommended control measures a great improvement has been brought about by the Beenleigh growers, but the situation in the Maryborough district is still very unsatisfactory. In the last few years the disease has been found in a number of scattered farms in the Moreton and Bundaberg-Isis districts. The varieties mainly affected at present are D. 1135 and 1900 Seedling, which are also susceptible to gumming disease and are gradually being discarded.

Unfortunately, some of the promising new varieties, including P.O.J. 2878 and other P.O.J. canes, have been found to be quite susceptible and the presence of Fiji disease constitutes a grave danger to the successful cultivation of these canes. In order to bring under control the very serious gumming disease, only varieties which have been proved resistant to gumming disease are now released for testing in the field. It is very important, that such work should not be hindered by infection with Fiji disease, particularly in the Bundaberg-Isis and Moreton districts, where gumming disease is worst and where Fiji disease could be practically eradicated with little trouble.

The presence of scattered stools with Fiji disease, however few, must be viewed seriously, and it would be well to take warning from recent developments in certain parts of Fiji. For many years the rate of spread of the disease had been quite slow, but, following the floods of some three years ago the rate of spread suddenly increased enormously, and in many fields the number of infected stools has increased ten-fold.

Symptoms.—Diseased setts will always give rise to diseased plants, and in most cases such plants will form no cane, but the stool will consist of a cluster of stunted shoots such as is illustrated in the foreground of Plate 157. The leaves of these stunted plants are short and erect, and generally of a darker green colour than the leaves of healthy plants. On examination of the under surface of these leaves there will

PLATE 157.
The stunted stools in the foreground resulted from the planting of diseased cuttings.

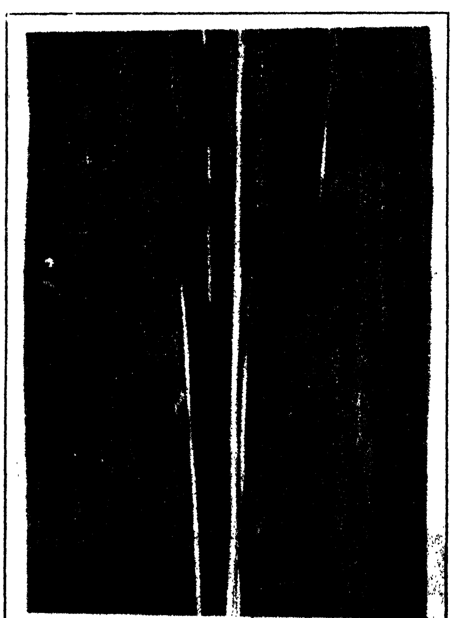


PLATE 158.
Small galls characteristic of Fiji disease on under surface of leaf, with one greatly elongated gall on the midrib.

be found the small galls which are characteristic of the disease. These are well illustrated in Plate 158; they are yellowish in colour, about 1-32 to 1-16 of an inch in diameter, and may be up to several inches in length, although the majority are only about half-an-inch long. They follow the direction of the veins of the leaf and are, in fact, enlarged veins. Such stunted diseased stools are readily found as soon as the surrounding healthy stools have commenced to make cane.

Diseases of this type are usually spread from plant to plant by insects, and if the stunted diseased stools described above are not uprooted and destroyed, the surrounding healthy stools will gradually become infected. This is known as secondary infection, and the diseased stalks present a very striking appearance. The leaves become stunted and stand out stiffly from the crown, while the younger leaves curl inwards and frequently have brownish scalded margins. The general appearance is as though some animal had bitten off the tops of the leaves, and is well illustrated in Plate 159. In cases of secondary infection often only one or two stalks may appear diseased, while the remaining stalks of the stool appear healthy. No further growth of the stalk follows after the production of these stunted leaves; the young leaves now produced gradually become smaller and smaller, and eventually the stalk dies.

Fiji disease is generally worse in ratoons than in plant cane. Ratoons from diseased stools produce only a cluster of small grass-like leaves on which, however, the characteristic leaf galls may be found.

Control.—The following methods of control are advised:—

1. Fiji disease is spread from farm to farm by means of diseased cuttings, and, therefore, careless exchanging of varieties cannot be too severely condemned where this disease exists.

2. Make a row-by-row examination of any cane intended for planting purposes and absolutely reject any field in which Fiji disease is found. Cane for planting purposes should be grown from specially selected stock in small "Farm Nursery" fields which can be inspected frequently.

3. Old susceptible varieties such as D. 1135 and 1900 Seedling should be discarded as soon as possible; this particularly applies to D. 1135 in the Moreton district. The varieties Q. 813 and H.Q. 285 are fairly resistant and their planting is encouraged.

4. Make careful inspections of the young plant and ratoon cane and immediately dig out and destroy any diseased stools. In the event of any disease being found continue the inspections throughout the life of the crop.

5. Plough out ratoons in which the disease has been found immediately after the final cutting. Diseased volunteer ratoons are a serious source of infection.

6. Reduce the number of varieties grown to the absolute minimum. Variety collectors are a menace to their neighbours as well as to themselves at any time, and particularly so in the presence of this disease.

PLATE 159.
Stiff stunted leaves, typical of Fiji disease.

THE SELECTION OF PINEAPPLE PLANTING MATERIAL.

By H. K. LEWCOCK, M.Sc., B.Sc.Agr., Assistant Plant Pathologist.

SINCE the inception of the present series of pineapple disease investigations in October, 1931, attention has been chiefly centred on the problem of determining the cause or causes of "wilt" and the conditions necessary for its development. "Wilt" is widespread and increasingly destructive in pineapple fields in Queensland and is unquestionably the most serious trouble with which growers have to contend. Field studies carried out during the past twelve months have shown that wilting of pineapple plants may arise from several different causes and that the expression of disease symptoms developing in wilt-affected fields varies according to the dominant underlying cause. In fact, on the basis of symptoms developed, it has been found possible to differentiate between three distinct types of wilt occurring in Queensland plantations, namely—

(*a*) Wilt due to poor drainage or other unsuitability of the soil;

(*b*) Wilt arising from nematode attack;

(*c*) Wilt disease.

The last-named type of wilt "(*c*)" is the one which is causing most serious concern amongst pineapple growers in Queensland at the present time.

Need for Careful Selection of Planting Material Demonstrated by Spread of Wilt Disease.

During the twelve months that the present investigations have been in progress, they have contributed, among other things, a fair amount of information concerning the manner in which the wilt disease is disseminated from diseased to healthy plantations. Considerable evidence has been secured which indicates that the spread of wilt disease throughout the pineapple-growing districts of Queensland has been largely brought about through the planting of suckers, slips, and tops derived from diseased plantations. In particular, the indiscriminate planting of tops obtained free from canning factories—which has been carried on extensively in some districts during the last two or three seasons—appears to have contributed greatly to the serious position in which wilt has placed the industry in those areas at the present time.

Other Advantages Accruing from Methodical Selection of Planting Material.

While most growers are now fully alive to the importance of taking planting material only from healthy fields, it is not so generally realised that even in apparently healthy fields rigorous selection of planting material is necessary if the general standard of the plantations is to be maintained. Long-experienced growers are almost all agreed that, during the past ten years, the vitality and productiveness of Queensland pineapple plantations have shown a gradual but noticeable decline, quite apart from losses attributable to the wilt disease. This is a

matter which vitally concerns every grower, as the profitable cultivation of pineapples depends not only on the price received for the fruit, but also on the yield per acre. Costs of production remain approximately the same whether the yield per acre of marketable fruit is 100 cases or 500 cases.

In view of the present depressed state of the industry, no grower can afford to ignore any economically practicable means whereby the productiveness of his plantations may be maintained or improved. Selection of planting material on a large scale is a simple and sure method not only of ensuring disease-free stock, but also of improving the whole general standard of pineapple plantations.

Characters to be Considered in the Selection of Planting Material.

In practising selection the first task is to get clearly in mind what characters of the parent plants should be perpetuated or eliminated and, secondly, to determine if these characters are hereditary or due merely to the conditions under which the parent plants are grown.

(a) *Resistance to Disease.*

The foremost consideration is, of course, that the planting stock shall be free from disease when planted and possess a high degree of resistance to disease infections throughout its subsequent development. These are the criteria on which any plan or method of selection must be based. However, while the grower may practise selection primarily to secure vigorous, disease-free stock, he can, with but little additional effort, so widen the basis for selection as to include improvement of type and increased productiveness.

With regard to the fruit itself, size and shape are the most important characters to be considered.

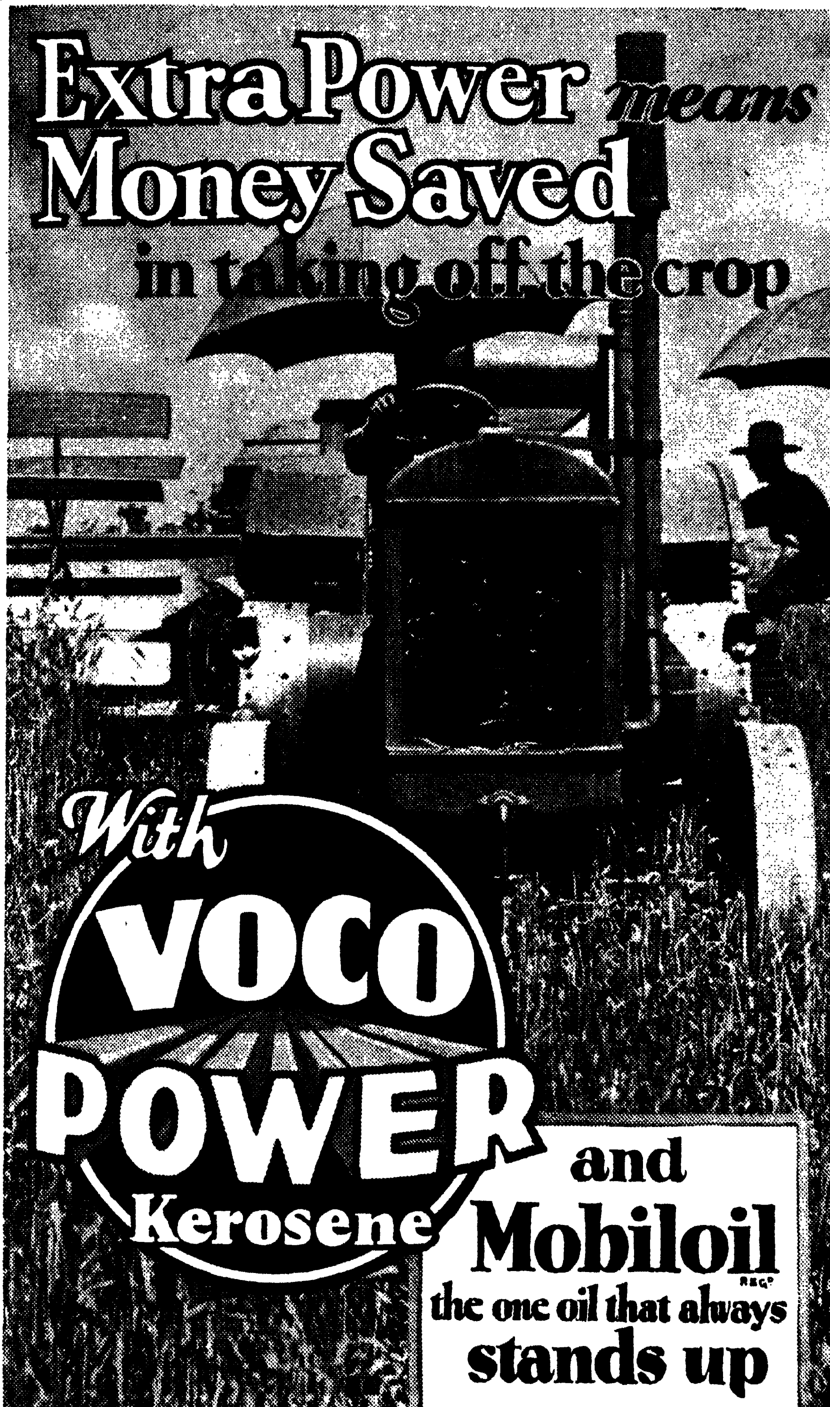
(b) *Size of Fruit.*

For canning purposes, uniformly large, heavy fruit are preferred, whilst for the fresh fruit market, medium-sized fruit are in chief demand.

Only meagre data are available as to whether the size of the fruit is a persistent character. However, the evidence at hand indicates that when selecting planting material from fields where the fruit is running medium to large in size, it is advisable to avoid plants bearing undersized fruit.

(c) *Shape of Fruit.*

Both for canning and market purposes it is desired that the fruits should be long and cylindrical in shape, of good diameter, and possessed of flat eyes and small cores. Cone-shaped fruit are particularly unsuited for canning and abnormalities such as multiple tops also detract from the commercial value of the fruit, even when they are of fair weight. Propagation tests carried out in Hawaii indicate that the shape of the fruit is an hereditary character and plants throwing slender, conical, or misshapen fruit should be avoided when selecting planting material. On the other hand, multiple tops and prominent eyes appear to be due to environment and there is no evidence at present available which would suggest that these characters are transmitted in planting material.


Extra Power means
Money Saved
in taking off the crop
With
VOCO
POWER
Kerosene
and
Mobiloil
REGD
the one oil that always
stands up

(d) *Type of Plant Growth.*

In determining the suitability of the plant as a source of propagating material, the characters which should be looked for are:—(1) general vigour and productiveness, (2) free production of suckers, and (3) resistance to disease. All growers are agreed as to the importance of perpetuating these desirable characters in their plantations. It should be borne in mind, however, that planting material should not be selected on vegetative characters alone, as vigorous growth is no guide to the type of fruit produced and lasting benefits from selection can only come from improved yields and types of fruit.

A word of caution is necessary with regard to plants throwing an excessive number of slips around the base of the fruit. This abnormality is known in Hawaii as "Collar of slips" and all the data so far available, both locally and in Hawaii, indicate that it is an hereditary characteristic. For this reason, and irrespective of their apparent vigour, all plants throwing a "collar of slips" should be strictly avoided when selecting planting material, as such plants produce few if any suckers and the yield from subsequent crops is reduced accordingly. "Collar of slips" is an especially mischievous variation from type in that it offers an obvious and very easy source of planting material which would be seized upon by careless or inexperienced growers. However, provided that the "collar of slips" type of plant is avoided, the number of slips borne (up to half a dozen) need not be considered in selecting parents from which to take planting material.

(e) *Size of Planting Material.*

Tests carried out in Florida by the United States Department of Agriculture indicate that only well-developed suckers or slips should be used as planting material. Other things being equal, it has been found that large-sized suckers and slips not only produce much stronger plants than under-sized weak ones, but they are also likely to be freer from disease and come into bearing much more quickly. It is important, therefore, not to collect planting material until it has attained a fairly advanced stage of development.

The Practice of Selection.

If possible, the selection of planting material should be made only from young plants at or near the time the first fruit (plant crop) is harvested. With plants of this age it is not only easier to recognise the characters which it is desired to perpetuate, but it is also possible to ensure, with some degree of certainty, that the planting material has been derived from wilt-free stock. In any case, worn out or abandoned plantations should not be used as sources of planting material under any circumstances, as in such fields it is exceedingly difficult to distinguish between healthy and diseased plants and quite impossible to determine which plants possess desirable vegetative and fruiting characteristics. For similar reasons, the use of butts as planting material is also much to be deprecated. Furthermore, suckers and slips for planting purposes should not be taken from apparently healthy plants growing adjacent to patches affected with wilt disease, as such plants may be already infected with wilt although the symptoms are not yet evident.

Finally, growers are cautioned not to purchase suckers or slips from plantations with which they are not personally familiar unless it is known on reliable authority that such plantations are free from wilt disease. Anyone who has seen the result of planting suckers or slips taken from wilt-affected plants will not henceforth be likely to use planting material from wilt-affected fields.

In order to ensure that suckers and slips are selected only from plants which meet the desired requirements of freedom from disease, vigorous growth and free production of suckers, combined with the production of weighty, well-shaped, and uniform fruit, such plants should be marked at fruiting time by dabbing a little white paint on several of the most prominent leaves. Then, when the time comes to gather the planting material after the fruit has been harvested, all plants not so marked are rigidly rejected irrespective of their apparent vigour or the number of suckers or slips which they have produced.

In Hawaii, where tops are used extensively for planting purposes, it is the practice to select and remove these from the fruit before they are harvested. By this practice—which is possible only because of the close proximity of the Hawaiian pineapple fields to the canning factories—it is insured that all tops used for planting have been individually selected from plants and fruits of the most desirable type. Unfortunately the selection of tops in this way is not practicable under Queensland conditions, particularly during the summer months, owing to the lengthy interval which elapses between the time the fruit is harvested and its arrival at the cannery.

As previously pointed out, the indiscriminate planting of tops procured free from canning factories is a practice which cannot be too strongly condemned. In a number of instances it has been possible to definitely trace the spread of wilt disease from a field planted with tops obtained from the canning factories. While such planting material may appear to offer a cheap means of planting up an area with pineapples, it is likely to prove very costly in the long run. The origin of tops procured in this way is unknown and, quite apart from the danger of disseminating diseases, the use of such planting material should be discontinued by every grower who seeks to maintain or improve the productivity of his plantation.

Does Continued Propagation from the Same Stock Lead to Deterioration?

Many growers are under the impression that the diminution in yield and vigour of their plantations, which has become so evident during recent years, is due to their stock "running out" and that the introduction of planting material from another district will be markedly beneficial and result in greatly increased yields. On many farms the deterioration of the pineapple stock is a very serious trouble, but it has resulted not so much from continued planting of the same stock as from continued indiscriminate propagation without selection.

Methodical and persistent selection of planting material—long recognised as being most important in maintaining yields from other vegetatively-propagated crops—is just as essential in securing the best

results from pineapple-growing. Several of the most successful pineapple-growers in Queensland have been planting from the same stock for as long as thirty years, and over this period the yields obtained per acre have increased rather than diminished. These results are largely due to the discrimination exercised in the choice of planting material. The intelligent grower realises that it pays to grow nothing but the best and that to introduce planting material from an unknown source on to his farm might jeopardise the health and vigor of his own planting stock which has taken him years of effort to bring to its present state of productiveness. Instances of the calamitous results following on the introduction of diseased planting material to previously healthy plantations have occurred all too frequently in Queensland during the past few years, as many growers can testify.

The purchase of planting stock from an old-established, productive, and disease-free plantation, for the purpose of improving the type and yield of fruit grown, is a commendable practice and one likely to benefit the industry generally; but the indiscriminate planting of stock from unknown sources, frequently from abandoned or worn-out fields, is detrimental to the interests of all concerned and cannot be too strongly condemned. Undesirable types of plants and fruits are perpetuated and, what is even more serious, diseases are frequently transmitted from unhealthy parent plants to new fields. There is no doubt whatever that many of the losses and failures experienced during recent years have been due in large measure to the indiscriminate planting of suckers, slips, stumps, and tops from weak, diseased, or worn-out plants.

From the foregoing discussion it should be evident that the advantages to be derived from careful selection of planting material are not open to argument; they are real, tangible, and practicable, as Hawaiian experience has proved beyond all shadow of doubt. The direct monetary benefits likely to accrue from increased yields should alone convince all growers of the value of the practice, but the indirect benefits resulting from the stabilisation of the canning industry with a standard quality product are likely to be even greater and more far-reaching.

SILO MOULDS FOR FARMERS.

A correspondent has called our attention to the fact that the New South Wales Department of Agriculture has had made three sets of silo moulds for renting out to farmers and has suggested that the Queensland Department might do likewise.

It may interest our readers to know that this Department has for many years maintained sets of silo moulds for loan to farmers for the purpose of erecting overhead circular concrete silos. The moulds are loaned free of charge, but the borrower is required to pay all transport charges involved and to undertake the return of the moulds in good order and condition after completion of his silo.

Applications for the loan of the moulds, which are of three sizes, viz.:—14 feet, 15 feet, and 17 feet diameter respectively, should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.

COTTON PLANTING AND CULTIVATING.

By R. W. PETERS, Cotton Experimentalist.*

BOTH of these phases of cotton-growing are of the utmost importance, and, as they are usually performed by the cotton-grower, an excellent opportunity is afforded him of making a close study of the efficiency being obtained in every operation connected with them. It is suggested, therefore, that if greater attention is given to all of the factors discussed, much better stands will be obtained generally and heavier yields will be produced at a much lower cost per lb. of seed cotton.

Time of Planting.

Time of planting, in conjunction with type of soil, is, in many respects, one of the most important factors contributing to the yield obtained from a cotton plant. This is especially true in Queensland on account of the nature of the rainfall distribution and the occurrence of various insect pests.

In the main cotton-growing areas, which are in the Central and Southern districts of this State, planting should be performed following the first good rains falling after the danger of late spring frosts is passed. This conclusion has been generally arrived at in most sections of these districts, and carefully conducted time of planting tests over a series of years at the Cotton Research Station have also borne this out.

The explanation appears to be that where cotton is planted in September and October under conditions of sufficient moisture to promote steady growth, the cool night temperatures cause the plants to make mostly a slow development of the parts above ground, but a good root system, characterised by a deep growing tap-root is, however, developed. If such plants are thinned out when five or six inches tall, a stocky toughened growth develops which generally forms a splendid type of fruiting system by the time the December rains commence. The night temperatures are higher from then on, and with the ample moisture sufficient crop is usually set to prevent the plant growing too rankly or becoming so succulent as to be attractive to the corn-ear worm unless an unsuitable variety is planted on very rich soil, or prolonged rainfall is experienced in December and January. The deep-growing tap-root, on the other hand, enables the plant to carry on normally, or with only moderate checks, during dry periods in the earlier stages of growth. It is likewise of marked assistance in supplying sufficient moisture to prevent excessive shedding of the crop, reducing size of bolls, and damaging of the fibres during dry periods later in the season. In fact, in seasons in which showers occur so frequently in the spring months that a root system develops consisting mostly of laterals near the surface, rather than a tap-root with well-formed lower laterals, great loss from shedding may be experienced during heat waves later in the season.

Cotton planted late in November or in December on alluvial or sandy loams, generally receives more than ample moisture with the commencement of the wet season, which usually is around mid-December. This causes the development of an excessive lateral rooting system in the upper layers of the soil, especially if it is of a fertile nature, which

* In a radio lecture from 4QG.

results in a rank growth of plant being made that is succulent and attractive to several insect pests, and is also prone to heavy shedding of crop in either very dry or wet spells.

Where one can plant on heavy clay loams of the type usually associated with large-sized box trees, or mixtures of ironbark and box trees, such as on the lower slopes of forest country, planting can be done later than on the rich loams of the alluvial flats. Two factors may contribute to this: the plant food balances, and the mechanical condition of the soils. The heavy clay loams usually have a higher carbon-nitrogen ratio and contain much less nitrogen than do the rich alluvial loams, hence there is not such a stimulant to rank growth. Also, the clay loams probably restrict the development of the fibrous roots to a greater extent than do the loams, so that the plant does not have such a net-work feeding system to supply it nitrogen during periods favourable for the formation of the latter.

Another feature of the mechanical condition of the soils to be considered is that during periods of heavy rain, when the plant on the rich alluvial loam has every stimulant to make rank growth, the rooting system of the plant in clay and clay loam is surrounded by sodden or partially water-logged soil, which restricts not only the availability of the plant foods, but brings about a condition whereby the plants would appear to be suffering somewhat from drought, although the soils are moist. Rank growth is seldom made on such types of soil during a wet season if the right variety of cotton has been selected, unless the soils are very fertile. On the other hand, in dry seasons or during prolonged dry spells, the clay subsoils which usually accompany these soils hold the moisture up to the upper root system better than is the case with the deeper alluvial loams. It is for these reasons that it is suggested where one contemplates growing cotton, a trial should be made, if possible on some of the clay loam soils of the various types which were described in Preparation of Land, the first lecturette of this series.

Planting may also be carried out later on soil the first or second year under cultivation from the virgin state, than where it has been cultivated for several years. The most pronounced difference may be obtained, even in the same row, where a portion of the crop is on old cultivated rich alluvial loam and the rest on land of the same type, but just broken up out of the virgin state. The explanation appears again to be that a better balance of plant food exists, the newly broken country having a much higher carbon-nitrogen ratio and generally a very low nitrogen content, which condition may continue for two or three seasons, after which a rapid increase of nitrogen occurs if in a district with moderate to good rainfall.

The best time to plant in the far Northern districts depends mostly on the nature of the rainfall. In the drier inland sections or where the summer rainfall is moderate and tapers off quickly, the regular spring plantings will probably be the most suitable. In the coastal areas where very heavy rainfall is experienced, growers have found planting around the end of February gives good results, for the crop then sets and matures during the drier winter months. Growers in the Northern areas are strongly recommended to experiment with various times of planting on their different soil types, for the variable conditions make it desirable for each individual to ascertain the best for his own peculiar combination of soil and climate.

It is pointed out that in the wetter coastal portions of the Northern districts, insect attacks may be the controlling factor regarding yield to be obtained. The slightest puncture of the bolls under the conditions of high humidity in these areas, allows of the entrance of boll rots which either lower the value of the contents of the boll or destroy it entirely. Every effort should be made, therefore, to plant the cotton crop in a well-exposed position where good air drainage can be obtained, and on soils which will not force too rank a growth. This also applies to the wetter coastal areas of the Central and Southern districts.

Necessity for Good Stands.

Another most important factor in successful cotton growing is the obtaining of a full stand of plants, for no matter how suitable the land is for cotton production, or how efficient the cultural methods are, a full stand is required to produce the maximum yield that the combination of seasonal and soil conditions will allow. This is recognised in older cotton-growing countries, where heavy rates of sowing are usually made, but here in Queensland the tendency has generally been to sow just sufficient to give a good commercial strike if all conditions are favourable. This has been brought about mostly through an effort to reduce thinning charges, or to eliminate them altogether by sowing so lightly as to require no thinning.

Rate of Sowing.

The recommended seed rate of sowing is 20 lb. per acre when planting in rows 4½ feet apart. It is believed that sowing less than this is a mistake, especially in the districts where heavy storms may be experienced at planting time, or where "dry planting" is practised. Undoubtedly fairly good stands can be obtained under favourable conditions from a rate as low as 10 lb. of undelinted seed per acre, but experience has proved the advantages of planting sufficient seed to guarantee practically a full stand under almost any conditions which may occur, rather than to risk planting with lighter rates that will just give commercial strikes if everything is all right. It is also pointed out that the tendency to plant on the clay loams is becoming more pronounced each season, as cotton on these soils appears to give better average results. It is when heavy packing rains occur on such soils just before the seedlings come through that the fallacy of light planting being advisable is fully demonstrated. Under such conditions a light sowing does not supply enough seed to provide sufficient lifting power to break through the packed soil, particularly if cold soil temperatures retard growth or cause rotting of seed; whereas with a 20-lb. rate of sowing a most remarkable amount of energy is developed which, provided the field is harrowed to break the surface crust, will give fairly good chances of obtaining a stand even under rather adverse conditions. This point should be especially remembered by the growers who practise dry planting.

Where delinted seed is being planted it is possible that 12 or 15 lb. per acre is ample on most soils on account of the more even distribution that is obtained with the planter and the greater number of seed per lb. One has only to try obtaining stands suitable for experimental work, however, to realise the large amount of row space with poor stands that occurs in most commercial fields of cotton, and it is suggested that every grower check up carefully on this point to see just what results he is obtaining.

Depth of Sowing.

The correct depth of sowing varies between 1½ to 2½ inches, depending on the condition of the seed-bed, amount of moisture in the surface soils, and the method of planting. The main objective is to get a good stand as quickly as possible. This requires planting the seed just deeply enough to have sufficient moisture to germinate them, and still not have the soil dry out before the young roots penetrate into the moist subsoils. For most soils under average conditions a depth of about 2 inches in moist, firm soil will allow of a good germination being obtained. This is especially true if a split-wheel type of planter is used. Where the seed is covered with scrapers, or by scufflers if planted in shallow furrows, 2½ inches will probably be better, as the soil is not compact and there is danger of the moisture being lost before germination is affected, particularly if drying winds are experienced.

If plantings are made at a greater depth than 2½ inches there is always danger of the seed rotting in a cold wet spring, and in a dry spring, while germinations may be obtained, the seedlings are frequently so long in coming through the surface that they are thin and spindly and of a pale yellowish colour rather than the usual healthy green. Such weakened seedlings are likely to be attacked by pests and diseases if wet weather is experienced, and may dry out if hot, dry winds prevail for any length of time. Generally speaking, the tendency is to plant too deeply, especially in the plantings in September, when the soil temperatures necessitate quick germination and appearance of the seedlings above ground.

Methods of Sowing.

There are several methods of sowing cotton seed being used in this State, all of which give good results when favourable conditions exist. With the exception of very large acreages, it is believed, however, that for most soils and conditions planting with a split wheel type of planter equipped with disc openers, after good rains have fallen, will give the best results. Where a seed-bed has been prepared properly and sufficiently early to store up any rain occurring during the winter months, planting with this type of planter after a fall of around an inch of rain, should give a perfect strike which can be maintained for some time without additional moisture being required. The advantage of using such a method of planting is that the disc openers push aside any crusts and the dry surface soils, thus distributing the seed at a uniform depth in moist, mellow earth which is packed firmly around them with a side pressure by the halves of the split wheels, and yet leaves a fine mulch on top of the seed. This packing effect tends to lift the ground moisture to the seed, thus ensuring ample to germinate them even if drying winds are experienced, while the mulch on top prevents excessive evaporation.

The same type of planter is excellently suited for planting seed in the dry soil, which practice is followed mostly by growers with large acreages. The system of dry planting has merits undoubtedly, where a large acreage has to be sown, but there are drawbacks as well. In springs when light showers are experienced much replanting has to be done, for the seed germinate and then either fail to come through the ground, or die off if no further rains occur in time to establish the rootlets in the subsoil moisture. This is especially true on land just broken up from the virgin state. It is recognised that a grower with

limited labour who intends planting a large area is faced with the necessity of dry planting to some extent in order to get his entire acreage sown on the first good rains in an average season. It is suggested, however, that only that portion of the acreage should be dry planted which experience indicates necessary to enable getting the whole crop sown in time to have all of it in ample moisture to give good germination.

There is always danger of the first planting rains being heavy storms, and where dry planting has been done on clay or clay loams, a crust is likely to be formed, which may greatly affect the germination and allow of only a patchy irregular stand being obtained, even if the field is well harrowed after the rain.

Many growers of small acreages in the older agricultural districts, who have maize planters unsuited for planting undelinted cotton seed, have adopted the practice of opening shallow furrows, sowing the seed by hand and then covering with either a harrow or scuffler. This system undoubtedly causes loss of moisture and undoes the benefit obtained from early preparation of the seed-bed. It is suggested, now that delinted seed can be obtained, that where an ordinary one or two row maize planter is available, the plates be modified to make them suitable for planting cotton seed. This can be done by enlarging the holes in the eight-holed plates and adjusting the gears to allow of greater rate of seeding.

The providing of delinted seed should prove of great assistance to the growers in the newly burned scrub areas, for it will eliminate the necessity of treating the seed to make it suitable for using in the "walking stick" hand planters. There may be some danger, however, of planting the delinted seed in the dry ash before the planting rains occur on account of the delinted seed germinating with less rainfall than would be the case with treated seed, hence in a spring experiencing light showery conditions, considerable replanting might be necessary. It is suggested, therefore, that a grower plant only a portion of his scrub acreage in the dry ash until sufficient experience has been obtained to demonstrate the degree of danger associated with such a practice in each type of scrub.

Spacing of Rows.

A spacing of 4½ feet between the rows is generally used in all of the cotton-growing areas. During the early stages of this present phase of cotton-growing, widths varying from 3½ to 5½ feet were used, but experiments and the general experiences of growers indicate that around 4½ feet appears to be a fairly good row spacing for most soils over a series of seasons. It is possible, however, that where cotton is being grown on the clay loam forest slopes away from the immediate coastal areas, a spacing of 4 feet or 4 feet 3 inches may be suitable. Usually the plants do not grow so tall on such soils as on the alluvial soils, hence ample sunlight and air drainage may be obtained with the slightly closer distances.

It is not recommended that spacings smaller than these be tried, for with heavy rainfall accompanied by prolonged cloudy weather in February, there is grave danger of sufficiently succulent growth being made to create dense shade. Experiences of past seasons have indicated that such conditions are conducive to insect attacks, accompanied by heavy losses from boll rots on the lower portions of the plants.

Cultivating.

It is strongly recommended that more attention should be paid to the cultivation of the cotton crops during the early stages of growth. The general tendency is to wait until the plants are well developed towards the thinning stage before the first cultivation is made. In many cases considerable growth of pigweeds and summer grass will be present by then, especially in a season with early showers, and it will be nearly impossible to destroy all of such growth without hand labour, even with the most efficient cultivators. This not only increases the cost of production needlessly, but where only light rainfall has been experienced, moisture has been robbed from the soil around the plants which should have been conserved by careful mulching and clean cultivation. The practice at the Cotton Research Station is to cultivate as soon as the seedlings are 2 or 3 inches high, using tines 2¼ inches wide, with guards to prevent the soil covering the plants. This eradicates all weed and grass seedlings and establishes a nice mulch around the plants, which helps to reduce evaporation and prevents the growth of weeds in the row. If further rainfall is experienced before thinning time, it will be necessary to cultivate again, otherwise this can be avoided until the thinning is done. A careful cultivation is given after this operation to re-establish the mulch between the rows and around the plants. This should be done as quickly as possible after the thinning, on account of the removal of most of the mulch in the row during the thinning operations.

PLATE 160.

Illustrating when the first cultivation of cotton should be made. The plants in the foreground were young velvet beans, which are very brittle, yet with the equipment being used no damage was done to them. The soil in which they were growing is of a clayey nature, and the cultivating was done three days after a hard rain.

Generally speaking, not more than three or four cultivations should be required after the one immediately following thinning. At each of these operations it is recommended that the soil be worked around the plants, for not only does this control most of the weed and grass growth and greatly reduce the evaporation, but a firm brace is established around the plants which helps to prevent them being blown over during severe storms when the soil is wet.

It is suggested that greater efficiency should be obtained in the cultivation operations. For most districts it is recommended that the best work can be done with the two-row cultivator of the type where the driver steers the carriage on which the tines are fastened, with his feet, rather than by depending entirely on guiding the horses. There are several makes of this type of machine on the market, all of which can be equipped with tines, sweeps, duck feet, and in some cases discs. By using such a type of machine, not only can better work be done close to the plants, thereby avoiding the necessity of much hand hoeing of the crop, but a greater acreage can be cultivated in a day, thus reducing the cost of production in two ways.

In conclusion, it is advised that the advantages gained through obtaining an early stand of cotton are ordinarily so great that every precaution should be taken to maintain one. It is recommended, therefore, that each grower obtain a supply of ingredients for making poisoned baits, before he plants. Every season a considerable number of growers experience severe losses through cutworms and false wire worms attacking their cotton crops when in the seedling stage. Both of these pests are night feeders, and by spreading poisoned baits amongst the plants around and in the affected areas as soon as possible after the attack first occurs, an efficient control can be quickly and cheaply effected.

A suitable bait can be made by thoroughly mixing 25 lb. bran and 1 lb. Paris green together in the dry state, then adding 1 quart of molasses and just sufficient water to make the bait moist and crumbly. As this bait is very poisonous, it should be kept away from poultry and live stock.

THE PREMIER AS A GARDENER.

The Premier (Mr. W. Forgan Smith), in opening the Spring Show of the Horticultural Society of Queensland at the Albert Hall, said: "Anyone who is a gardener must have an appreciation of nature and possess a love of beauty." He revealed that he was an enthusiastic gardener, having in his boyhood been trained to a thorough appreciation of the scientific side of the work by his father, who was a professional horticulturist. Mr. Forgan Smith recalled how he used to assist his father to prepare horticultural exhibits for some of the biggest flower shows held in Great Britain, and their sense of satisfaction at frequent success. As a result of those experiences, he said, he knew full well the wealth of painstaking care that had been bestowed on the magnificent exhibits entered in that afternoon's show. Referring to the success of gardeners in improving and developing varieties of flowers by hybridisation and other scientific methods, the Premier said that there should be ample opportunity for Queensland horticulturists to develop an export trade in flower seeds, which, no doubt, would be eagerly sought by gardeners in other parts of the world.

COTTON THINNING AND SPACING.

By R. W. PETERS, Cotton Experimentalist.*

THE subject for the fourth lecturette of the present series on cotton-growing is cotton-thinning and spacing.

There is a decided tendency amongst many cotton-growers in Queensland to omit thinning their crop. This has been brought about in an attempt to reduce cost of production, especially with growers of the larger acreages, and also through a certain amount of propaganda, which has been based on the results secured in parts of the United States rather than on any extensive experimental data obtained here. It is unfortunate that there is this tendency, for, generally speaking, it is extremely doubtful if growers can afford not to thin.

Before discussing the merits of thinning in this State, it may be advisable to explain briefly the conditions in the cotton-growing areas of the United States, where close spacing or no thinning at all has come into prominence in recent years. In the first place, prior to the advent of the boll weevil, close spacing was seldom tried, and the average yield per acre was higher than since the boll weevil arrived and close spacing has been practised. The fifteen-year average prior to when the boll weevil first caused such serious damage in the wetter Eastern States was 185 lb. of lint cotton per acre, as compared with 158 lb. for the fifteen-year period following that, and 159 lb. for the last ten-year period when closer spacing and dusting for the weevil has been more widely practised, and also varieties with higher lint percentages have been grown. It is significant in this respect, that experiments in recent years on the richer soils in the districts with mid-seasonal rainfall more comparable to that of Queensland, have frequently yielded results in favour of the 20 to 24 in. spacings. Undoubtedly, the boll weevil is the major factor controlling yields to be obtained in much of the rainfall-grown cotton belt, hence any method which combats it successfully is the most profitable one. This has been brought out clearly by H. B. Brown, the noted American cotton investigator, when, in giving a resumé of row and plant spacing tests before the advent of the boll weevil, stated as follows:—

"On the less fertile land the closer spacing gave yields in the majority of cases; on the rich lands wide spacing gave best yields in a number of cases, but the results varied widely, due probably to differences in rainfall, length of fruiting season, &c. Prior to the coming of the boll weevil the fruiting season of the cotton plant was long in most parts of the cotton belt, and there was enough time for plants to grow large and utilise much space. It did not matter if the plants were not close together. With time, especially on rich soil, they grew large and used all the space available. Under such conditions wide spacing frequently gave good returns. With heavy weevil infestation, however, the fruit must be set in a very short time, say, a month or less. This makes it necessary for more plants to be left on the land if all the space is to be used to the best advantage."

Discussing the results obtained from spacing tests under weevil conditions, he stated that "it seems on poor land, both with and without weevils, cotton should be spaced closely, say, two to four plants per hill,

* In a radio lecture from 4QG.

with hills 10 to 12 in. apart in rows 3 ft. wide. On medium rich to rich soils it is easily possible to get cotton spaced too closely if weevils are not present, say, two stalks in a hill closer than 12 in. in 3½-ft. rows." He also recognised that varietal differences in habit of growth affect the spacing, and stated: "It stands to reason, however, that a vigorous, rank growing variety will be able to use to advantage more space than a weaker, smaller growing variety. In cases of rank foliage, crowding the plants may result in much boll rot during rainy seasons. The dense shade produced is favourable for fungus growth on the bolls."

American Soil and Climatic Conditions.

Now these results have been obtained under soil and climatic conditions much more favourable for close spacing of plants and rows than is the case in most of the cotton areas in Queensland.

In the first place, much of the cotton areas of the United States where heavy mid-seasonal rainfall is experienced have been farmed mostly with cotton for many years, which has resulted in the fertility of the soil being greatly depleted. In fact, applications of as heavy as 1,000 to 1,200 lb. per acre of fertilizers containing heavy amounts of growth-producing plant foods are recommended for portions of these districts, which indicates how poor they are. As fertilizing is carried out to a large extent, it can be realised that leaving many of such small plants as would be grown under such conditions naturally should return the most cotton per acre.

Likewise the rainfall is generally suitable for close spacing all over the American cotton belt. Frequently preparation of the seed bed is delayed on account of the wet soils, and often planting is held up for the same reason. The plants usually start off, therefore, with ample moisture in the soil, and leaving them close together under such conditions does not cause any severe checking of growth or shedding. The mid-seasonal rainfall is also usually suitable for closer spacing, so that the closely-spaced plants on the poorer to medium soils really do not give such a crowded appearance as is the case here.

Queensland Conditions.

The conditions which have just been lightly touched upon are in marked contrast to those generally ruling in most of the cotton areas in Queensland. Usually the crop is planted following storms, which often do not wet the soil to any marked depth. Long dry periods may follow the germination of the seed, and seedling growth is frequently very slow, and, in some seasons, badly checked to the point of loss of stand occurring unless thinning is done early to reduce competition for what moisture is present. With the starting of the wet season entirely different conditions may exist and much heavier rainfall occurs during December, January, and February than is generally the case in the corresponding period of plant growth in most of the American cotton centres. Likewise most of the Queensland cotton soils are much richer than those of the American cotton belt, many soil analyses having shown high amounts of nitrogen for cotton-growing under such mid-seasonal rainfall as is frequently experienced here. It can be realised, therefore, that methods of cotton culture successful under American conditions may have but little value in much of the Queensland cotton districts.

Results from Queensland Spacing Tests.

The ascertaining of the most suitable plant and row spacings under Queensland conditions has not been as comprehensive as desired. The growers have mostly been divided into two schools of thought—little or no thinning, and spacing out to 20 to 24 inches apart at various heights of the plants. This has made it most difficult to arouse interest in thinning tests, with the result that most of the data has been obtained from tests carried out on different experiment stations. Climatic variations, severe attacks from migrations of corn-ear worm, and soil inequalities have affected the results there, so that the data obtained has not given any actual consistent clear-cut indication of the relative merits of the spacings tried out.

Generally speaking, however, the results have been in keeping with many observations made over several years on most of the types of soils on which cotton is grown in this State. These have indicated that in seasons of good spring rains and sufficient rainfall to promote steady but not luxuriant plant growth during the critical period of fruit formation, spacing singly a foot apart, or on some of the less fertile soils, no thinning, if a light seeding has been used, may give excellent yields; likewise so will 18 to 24 inch single spacing, if the plants are thinned when 6 to 8 inches tall. In dry springs, however, or when good early rains occur and then droughty conditions are experienced in mid-season, much greater shedding of flower buds and young bolls takes place in the closer spacings than where the plants are left singly 20 to 24 inches apart.

In the spacing experiments carried out at the Cotton Research Station, the closer spacings have always given greater flower production during the first half of the season, but in only one season has this gain been of benefit in the final yield obtained. This was in the 1927-28 crop, when climatic conditions were almost ideal during the growing season, as indicated by the exceptionally good yields obtained all through the district. On the Research Station the plot yields ranged mostly from 12 to 1,600 lb. of seed cotton per acre, which included many kinds of experiments. In this season 12-inch spacing in rows 4 feet apart gave the highest yield of the experiment, and the same spacing was the best where the rows were 4½ and 5 feet apart.

These results were in marked contrast to those obtained in the following season, which experienced extremely dry conditions in January. In the similar experiment of that season, the 12-inch spaced plants showed the effect of the different heat waves more than either the 24 or 36 inch spacings in all row widths. Although the flower counts were in favour of the closest spacing they really portrayed the drought effect rather than indicating heavier yielding, for the wider spacing were really benefited by the dry spells.

Similar results were likewise obtained in 1929-30, when another severe heat wave was experienced in January and extremely dry conditions ruled during March and April. The following brief notes describe the plant growth of the different spacings:—

"Unthinned—small crowded, whip-like plants carrying a few bolls which were mostly on the outer fruiting branches of the vegetative branches. The bolls were generally smaller than those of 2 feet single

SHEEP PARASITES AND DISEASES.

By J. CAREW, Senior Instructor in Sheep and Wool.

QUEENSLAND, like all other countries, has its share of parasites and diseases; still, generally speaking, the sheep of this State are singularly healthy.

With the exception of the blowfly and wild dogs, a considerable area of the western portion of the State is free from parasites, disease, and pests, while in other vast adjoining areas, they are easily controlled.

Considering that nearly all the complaints which affect our sheep can be controlled successfully by cleanliness, dipping, and drenching, it is remarkable that a greater effort is not made by our sheep farmers generally to free both flocks and pastures of at least some of the diseases and pests.

One parasite which is responsible for the most loss, especially in coastal, semi-coastal and plateau areas in Queensland is the stomach worm (*Hæmonchus* or *Strongylus contortus*), and as this can be controlled, if not totally eradicated, by systematic drenching and good management, a worthy effort should be made to free not only the sheep but the pastures from this pest.

Drenching to save the life of the sheep is not sufficient, but an effort should be made to maintain them in full health and vigour. A worm-infested ewe cannot rear a vigorous lamb. An unthrifty lamb cannot develop into a good sheep, and will be too weak in constitution to resist successfully worm infestation.

By controlling stomach worms many other internal parasites are held in check, such as the lung and nodule worms. No doubt each year is claiming either an increase in the number of parasites or a greater spread of those in existence here.

To control the spread of both parasites and disease among stock is of vital importance, not only to those concerned in the sheep and wool industry, but to the welfare of the State in general.

Lice in Sheep (*Trichodectes sphearocephalus*).

This parasite is a louse common to Queensland and is responsible for a far greater loss both in wool and flesh than is usually realised.

Fortunately they can be got rid of completely by dipping, but in spite of this fact they are spreading considerably in Queensland. This insect does not leave its host unless to transfer itself to another sheep which it does quickly if conditions, especially after shearing, are favourable. Besides the loss of wool from biting and scratching, there are portions of the fleece that become thin and ropey, which affects the actual market price. When wool is rubbed off on stumps, fences or otherwise, it is possible that lice will be adhering to it, thus providing another means of fresh infestation. Lice live on the wool close to the skin and cause considerable irritation. If lambs are running with lousy ewes they will soon become infested, especially after shearing. Owing to the skin of lambs being more tender, they suffer to a greater extent from lice than adult sheep. The irritation that is set up and the discomfort caused interferes with the nervous system and feeding, thus retarding that growth and development of lambs so important in their early life.

Treatment.

Dipping in one of the well-recognised proprietary poisonous dips, preferably the arsenical powder dips, is the most effective treatment.

The best time to dip is from four to five weeks after shearing. This gives the cuts ample time to heal, the skin to become normal, and the growth of wool sufficiently long to hold the dip, still allowing the mixture to penetrate to the skin without lengthy immersion. One dipping in a poisonous powder dip that adheres well to the wool may free and keep the sheep free from lice from shearing to shearing, as sufficient of the poison is held in the wool to destroy the young lice that hatch out after being dipped.

Dipping does not destroy the nits or prevent them from hatching out, but they are easily killed when they first emerge from the egg.

A home-made dip mixture can be made by using 2 lb. arsenic, 2 lb. carbonate soda, to 100 gallons of water. The ingredients should be first boiled in a smaller quantity of water until thoroughly dissolved, then diluted to the proper strength. With this mixture as well as with other dips which do not adhere to the wool for a lengthy period, it is best to give two dippings at intervals of two weeks. When

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ON

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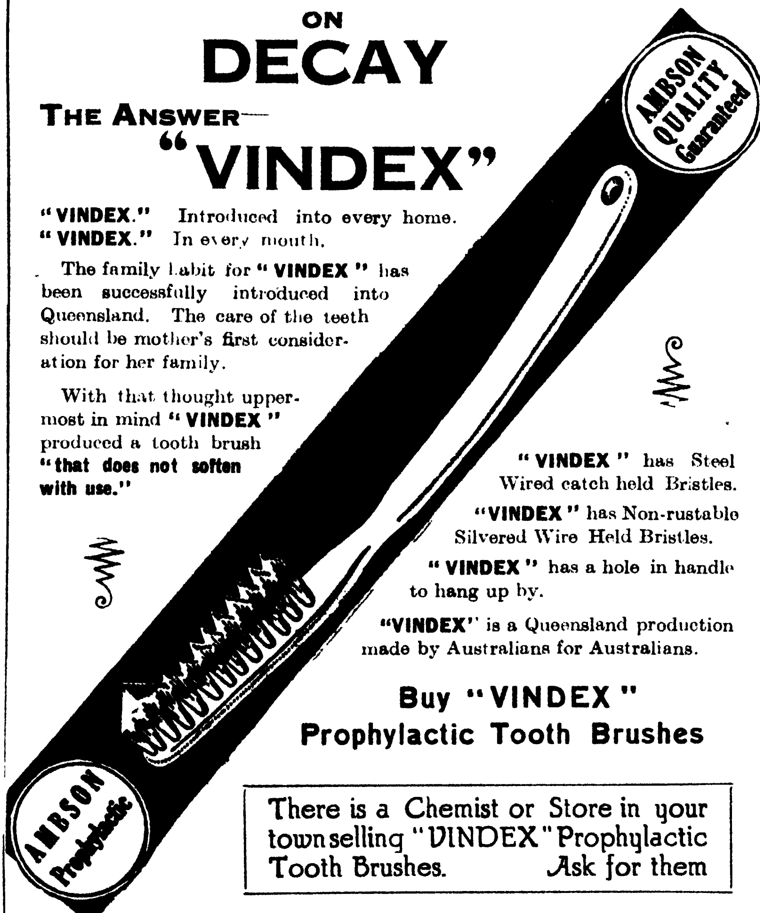

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dipping to control lice it is better to dip the whole of the flock at the same time. If the wool is at half length the mixture should be weakened and the sheep immersed until saturated to the skin.

Care in Dipping.

Sheep should be handled carefully throughout the whole dipping operation. The mixture should be correct and well stirred up. Extremes in temperatures should be avoided. The sheep should not be overheated or thirsty when being put through the dip. Do not crowd sheep into the draining pens, as scalding may result. Sheep should be allowed access to a shaded enclosure after draining, and not allowed over their pasture until fairly dry. Avoid driving for a few hours after dipping, and then as quietly as possible.

Rain soon after dipping may cause scalding by carrying some of the mixture to the skin, or some of it may be washed off on to the pasture and cause poisoning.

The Sheep Tick or Louse Fly (*Melophagus ovinus*).

This parasite causes considerable discomfort to sheep, especially if present in large numbers.

When ticky sheep are shorn and the wool pressed, the ticks cause a stain in the wool which is very objectionable and will cause a decline in the value of wool.

Two dippings, as recommended for controlling sheep lice, will free the sheep of this parasite.

The first dipping should take place from three to six weeks after shearing.

Scrub Ticks (*Ixodes holocyclus*).

Sheep running on scrub lands partly cleared within a limited distance from the coast, probably 150 miles, are liable to attack. This is one of the worst external parasites, as they set up a paralysis which lasts for eight or ten days, and in most cases prove fatal.

Prevention is recommended by a thorough clean-up of all scrub lands to which sheep have access, and the burning of all dead grass.

Treatment.

Dissolve 9 grains of Trypan Blue per 1 fluid oz. of water. As the solution cools a sediment falls which is removed by filtering it through a funnel in which is placed a properly folded filter paper or a piece of clean fine linen. This solution is then injected under the skin by means of a thoroughly sterilised hypodermic syringe.

Dose: One tablespoon for lambs. Increase the dose in keeping with size and age of sheep to five tablespoons. A second dose may be given twelve hours later, if necessary.

Sucking Sheep Louse (*Linogthanous ovillus*).

This parasite has been found in a few places in Queensland distant from each other. Where present, they cause much damage to the wool, leaving it spongy, devoid of yolk, and in a very mushy condition.

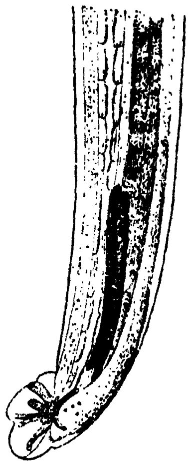
Stomach Worms (*Strongylus or Haemonchus contortus*).

Scientists agree that they have worked out the life history of these worms, which is a big advantage in controlling them.

When stomach worms are known to be in the pasture we cannot afford to neglect the sheep, especially if weaners are amongst them. The conditions suitable for worms to develop is when the weather is warm and the soil and grass moist. Under these same conditions grass will grow quickly and give a good nutritious food in abundance.

Sheep will take in worms if on the grass, but may not show any evil effects while the pasture is good.

The worms should be expelled from the sheep before they commence to lay eggs, which they do in large numbers, thereby contaminating the pasture while the sheep are still looking healthy. Drenching is sure to diminish the number of worms, but it may take more than one drench to completely eradicate all of them. (Plates 161-162.)



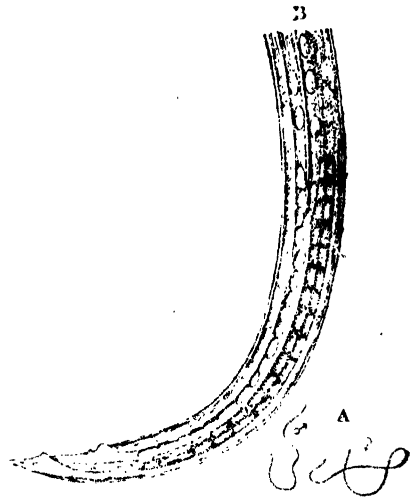


PLATE 161.

STRONGYLUS RUFESCENS.

Caudal extremity of the male; magnified 100 diameters.—*Railliet.*

STRONGYLUS RUFESCENS.

Found in air passages of sheep and goats.

a—Male and female; natural size.

b—Caudal extremity of the female; magfied 50 diameters.—*Railliet.*

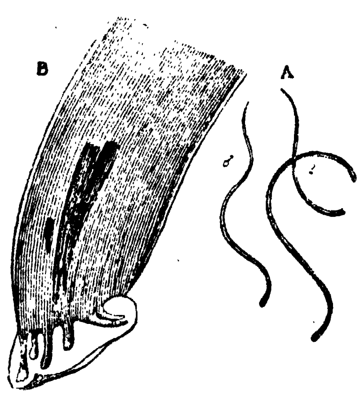


PLATE 162.

STRONGYLUS MIRCURIS.

Found in air passages of calves and older cattle.

a—Male and female; natural size.

b—Caudal extremity of the male; magnified 100 diameters.—*Railliet.*

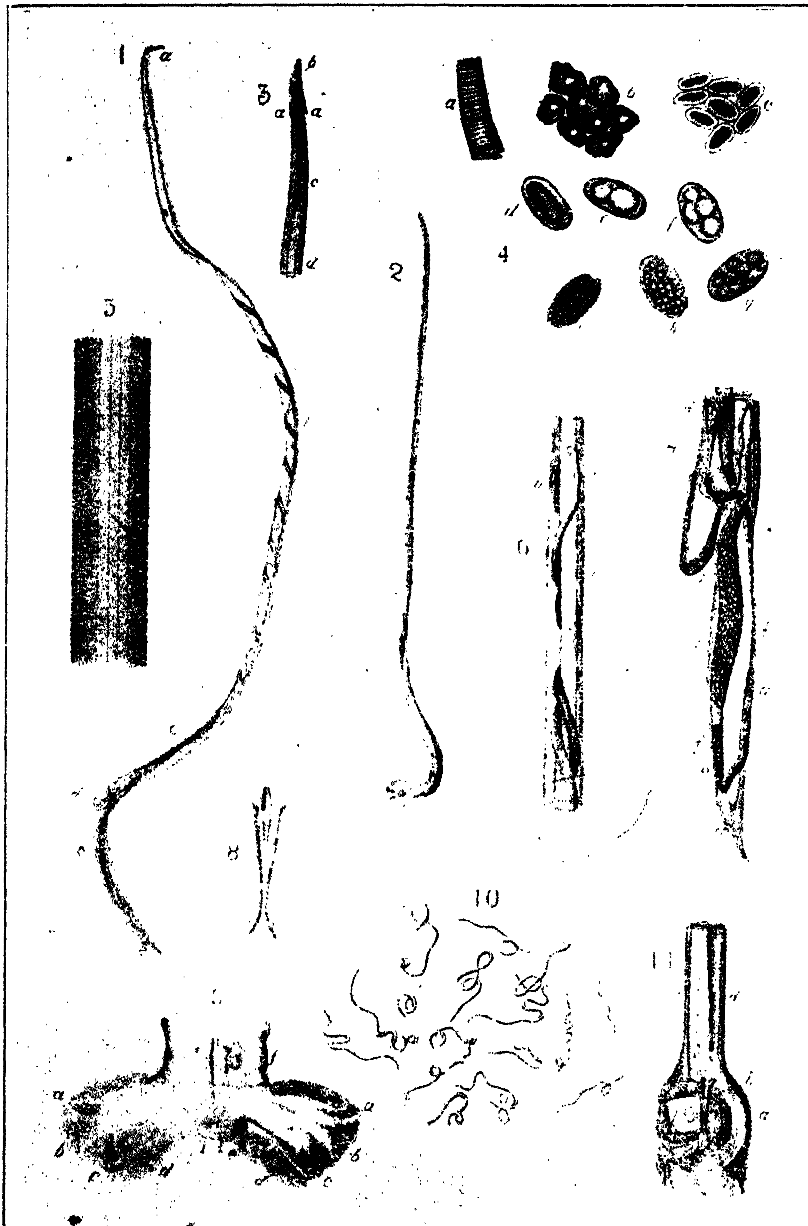


PLATE 163.

STRONGYLUS CONTORTUS (The Twisted Stomach-worm).

Cooper Curtice, D.V.S., M.D.]

DESCRIPTION OF PLATE 163.

Strongylus contortus.

FIG. 1.—Adult female magnified six times: *a*, head; *b*, ovaries wound around intestines; *d*, papillæ.

FIG. 2.—Adult male magnified six times.

FIG. 3.—Head: *a*, two-barbed Papillæ.

FIG. 4.—Eggs highly magnified: *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, different stages of development; *i*, egg as it is laid.

FIG. 5.—Skin showing nine of eighteen longitudinal lines.

FIG. 6.—Portion of female: *a*, intestines, *b*, *b*, end of ovary.

FIG. 7.—Caudal end of female: *a*, vulva, *b*, *c*, vagina: *d*, *d*, uteri filled with eggs; *e*, oviduct; *f*, *f*, ovary; *g*, intestines.

FIG. 8.—Spicula, enlarged.

FIG. 9.—Bursa expanded to show costæ.

FIG. 10.—Group of males and females; natural size.

FIG. 11.—Caudal end of male: *a*, bursa; *b*, spicula; *c*, seminal reservoir; *d*, intestine.

Should the sheep be allowed to run on the same pasture they were grazing on before drenching, and which was allowed to become contaminated, it stands to reason that, although the worms have been eradicated from the sheep they will soon become re-infested.

This fresh infestation continues during the time the embryos remain alive on the grass which the sheep consume.

As long as this supply continues, drenching the sheep is necessary to enable them to resist the fresh attack. Should weaners be in the flock where the infestation of worms is serious, their constitution is bound to suffer to a greater extent than grown sheep, consequently they take longer to return to normal.

When introducing sheep to country free from worms, care should be taken that they receive two good drenches at intervals of eight days. While waiting for the second drench they should be placed in a small paddock that can be ploughed immediately after they are taken out. This precaution is necessary, for although the first drench may kill all the worms (which is not likely), the eggs may still remain. If the sheep are confined to a given area all eggs will be excreted, and unless the embryos gain access to grass they perish. Ploughing the land and bringing it into thorough cultivation destroys the worm. If the sheep are allowed to roam over the pasture soon after drenching with sufficient heat and moisture present, the eggs hatch out within a few days and live on the organic matter contained in the droppings, after which they moult and attach themselves to a blade of grass where they develop a protective covering and await the host.

The eggs will not hatch out at a low temperature or under dry conditions, but remain in a dormant state for several months. After attaching themselves to the grass they are capable of remaining in the ensheathed stage for at least six months, as reported by Sir Arnold Theilier as the result of his investigations in South Africa.

Many well-known helminthologists agree that by withholding ruminating animals from a pasture for twelve months it can be entirely freed from worms, also that they will not reappear unless introduced by a worm-infested ruminant (sheep, goats, or cattle).

Sheep, like other ruminating animals, have four stomachs, first the paunch or rumen, where the rough food is conveyed and held until brought up in the form of balls, thoroughly masticated, and returned to the second stomach or reticulum.

It is then passed through the third stomach, the omasum or bible, to the fourth or true stomach, the abomasum, which digests and commences the assimilation of the food. It is here that the stomach worms are to be found. The numbers present indicate the severity of the attack.

Symptoms.

If worms are present in small numbers little or no indication of their presence can be discerned.

While the food is sufficiently good to make enough blood for the sheep after the worms are satisfied, no evil effects are shown.

When the nutritive value of the food diminishes the worms get first share of blood, leaving the sheep with an insufficient supply. When this stage is reached the quantity and value of the food decide the amount of blood that is made, while the number of worms determine the length of time the sheep can withstand the attack without showing the evil effects.

Pale skin denotes the want of blood. This is most noticeable about the face, eyes, and lips. The sheep become sluggish, which denotes a derangement of the digestive organs followed by continued scouring, an abnormal thirst followed by bottle (a swelling under the jaws), and general debility.

Great care must be exercised when driving sheep in this state, as if forced and overheated they are likely to die, especially if in fat condition. When forced they usually lie down flat on their bellies with their legs tucked in under them. They then stretch their heads out, resting the bottom of their necks on the ground.

Treatment.

According to the recommendations of such men as Sir A. Thieler, Chief Veterinary Director, South Africa, Mr. I. F. Craig, M.A., M.R.C.V.S., and Mr. A. H. Cory, M.R.C.V.S., Chief Inspector of Stock, Queensland, all agree that the first object of all treatment of disease is in removing the cause. In this case the removal of worms should be brought about by anthelmentics. This method has been well supported in many experiments carried out in Australia by such prominent men as H. R. Seddon, D.V.Sc., and I. Clunies Ross, D.V.Sc., at Glenfield Veterinary Research Station, New South Wales, where a large number of drugs were used. These were reduced to four. In coming to this decision they state in their conclusions, Veterinary Research Report, 1927-28, page 81: "From the foregoing it would appear that the most useful methods are—(*a*) copper sulphate, (*b*) copper sulphate and mustard, (*c*) carbon tetrachloride, and (*d*) tetrachlorethylene. The results in brief against *Hæmonchus* (*Strongylus*) *contortus* in the case of carbon tetrachloride showed considerable variation, generally good. The dose of copper sulphate (which from a general review of the results should be combined with mustard) might commence with a dose of 1¼ grains for lambs, say 30 to 40 lb. in weight, and be increased proportionately for sheep of greater weight. The therapeutic dose of tetrachlorethylene appears to be 2½ to 5 c.c., and gives generally satisfactory results against *Hæmonchus contortus*. As against the Trichostrongyles, the results with tetrachlorethylene appeared less satisfactory, and against this parasite were not as good as against *H. contortus*. Comparing now these treatments of parasitic gastritis, one may conclude—(*e*) that copper sulphate and mustard and carbon tetrachloride are both good methods of treatment, and efficiency of about 75 per cent. and upwards may be obtained as a routine with suitable dosage. Even with large doses, however, there is liable to be variation amongst animals given the same dose. (*f*) It must be borne in mind that the best results wih copper sulphate and mustard appear to be gained by starving animals before treatment. With carbon tetrachloride, on the other hand, no such preparation is necessary. (*g*) As to the relative safety, there is no question but that copper sulphate and mustard is the safer drench."

These conclusions are much in keeping with the results secured in my tests at Milmerran and Yeerongpilly in 1929. The addition of bluestone to the arsenic and epsom salts formula proved equal to the bluestone and mustard for stomach worms, and more satisfactory in connection with the control of the Nodule Worm. Since these tests were completed it has been decided to reduce the amount of bluestone to 4 oz. when being used in conjunction with the arsenic-epsom salts formula.

The amount of food available at the time the drenching is to take place should to a great extent decide the length of time to starve the sheep before drenching. When grass in the pasture is scarce, short, and dry, they may be kept away from water only.

Where worms are known to exist the drenching should be regular and administered before acute symptoms set in.

Ewes rearing lambs should be kept as free as possible from worms, as, if badly infested, their milk supply is the first to diminish. This causes the lambs to take to the grass with which they consume worms from which they soon become unthrifty and anaemic.

Drenching under the most favourable circumstances necessitates a considerable amount of extra work and expense, as well as being hard on the sheep. If they are wormy and given a good drench they improve quickly, but if given a drench that will not kill even the worms in the fourth stomach much work and expense is incurred without securing any benefit.

This year (1932) heavy losses have been reported after drenching with carbon tetrachloride. As practically all losses were among sheep running on light forest or traprock country, it would appear that the losses were brought about by a mineral deficiency. Should a deficiency be known to exist, this drug should be substituted by one of the other drenches recommended, or the sheep allowed free access to a good stock lick for some time before drenching.

The sheep should be drenched with a mixture of arsenic and epsom salts.

The ingredients are:—

2 oz. arsenic (95 to 98 per cent. purity),
6 lb. epsom salts, to
5 gallons water.

To Prepare.—Bring 2½ to 3 gallons of water to the boil, then add the 2 oz. of arsenic and the 6 lb. epsom salts. Stir and bring to a brisk boil. Boil vigorously for about five minutes, and stir well. Then allow to simmer for half an hour longer, stirring occasionally. Add cold water to make up to the 5 gallons. This mixture will now be ready for immediate use.

Dose.—

For grown sheep, 2 fluid oz.;
For weaners, 8 to 15 months, 1½ fluid oz.;
From four to eight months, 1 fluid oz.

Lambs under three months old should have the dose reduced according to size and age of lamb. If the milk secretion is good, the lambs will not need drenching, but if eating grass freely they will pick up the worms and suffer more severely owing to their weaker constitution, therefore drench them if necessary. A flask can be procured suitable for administering the drench according to dose; otherwise a sauce bottle will be found suitable, but will require to have the dose measured properly. The sheep should be kept away from food and water for at least twelve hours before drenching (if not already starving) and about four hours after drenching (at least from water).

The sheep should be on all fours while being drenched, the operator holding the sheep between the knees with the left hand under the jaw and the right hand administering the drench with the flask. Should the sheep struggle or cough discontinue pouring the drench and wait till the sheep becomes normal before continuing. It is usually found most convenient to run a number of sheep into a narrow lane about 30 in. wide for drenching purposes.

By dissolving 4 oz. of bluestone and adding it to the arsenic and epsom salts mixture when making up to the 5 gallons a powerful drench is secured at a low cost which is suitable for the control of stomach worms and will also kill tape worms and at least some of the bent-head round worms in the large intestines.

The bluestone should be dissolved separately in an earthenware, glass, or wooden container.

The doses are as set out in the recommendations for dosing with the ordinary arsenic and epsom salts drench, but must be modified regarding lambs and growing sheep, and can be as follows:—Grown sheep, 2 fluid oz., hoggets (2-tooth) 1½ fluid oz., and then reduced according to size and age of lamb to ·1 oz. at six months, continuing the reduction to younger lambs, or give the arsenic and epsom salts.

Bluestone Drench for Stomach Worms.

As a change from the arsenical drench, the bluestone and mustard drench can be successfully used, say every third or fourth drench.

The ingredients are: —

1 lb. bluestone,
1 lb. fresh mustard,
10 gallons water.

To Prepare.—Suspend the bluestone in soft or rain water secured in a piece of hessian. Mix the mustard in a little water until thoroughly moistened, then dilute with larger quantity and mix with bluestone water, which is made up to the full quantity of 10 gallons.

When all the bluestone is dissolved it should be well stirred and administered in correct doses.

Grown sheep, 4 fluid oz.; weaners, twelve months old, 3 fluid oz.; lambs, four months old, 2 fluid oz. The bluestone water should not come in contact with metal. Wood or enamelware is suitable. Care must be exercised in administering this drench, as it is a bigger does than the arsenical dose, and takes longer to swallow. The sheep are more apt to take it on their lungs, which is injurious, and may prove fatal. This drench is useful if administered after giving the sheep the same treatment as recommended for the arsenical drench.

Nodule Worms in Sheep.

This affection is caused by a worm known as *Oesphagostoma Columbianum.* The lesions caused by this parasite are in the form of nodules on the intestines from which it gets many local names. The life history of this parasite is that it enters the wall of the intestine where it remains from three weeks to at least four months, during which time it is surrounded by a cyst which causes the tumours or nodules. It then emerges from the nodule into the large intestine, where it matures and lays eggs. According to the Thirteenth and Fourteenth Reports of the Director of Veterinary Education, South Africa, they are known to live in the large intestine of sheep for twenty-one months, during which time they lay eggs in large numbers. One lamb artificially infected with 2,000 larvæ was reported to have voided 2,000,000 eggs in one day, and continued in irregular numbers up to the time of its death at four and a-half months, when it had voided over 31,000,000 eggs. From the time the egg is passed outwith the fæces to its encysting itself in the walls of the intestine there is some doubt, but it is known that in moist, warm places the eggs hatch out in a few days and are taken in by the sheep.

They pass through three moulting stages before maturity in the large intestine, from which they are difficult to dislodge with drenches. The embryos or young worms are first found in the wall of the intestines, the numbers present being the deciding factor against the health of the sheep. Diarrhœa and emaciation are the results of the presence of those worms when in large numbers, and the general condition of the flock is largely reduced by this parasite.

Still, it is surprising how the majority of sheep killed for mutton are found to be in good condition, although affected with the parasite.

Treatment.

Treatment consists of the elimination of the mature worms from the bowels by the use of such agents as—

(1) One part turpentine to sixteen parts of milk, the dose varying from 2 to 4 oz.

(2) One teaspoon turpentine to 1 oz. castor or raw linseed oil.

(3) One teaspoon Kerol to 1 oz. castor or raw linseed oil.

(4) Enema treatment—One and three-quarters to two pints of Acacia gum solution or lukewarm soap suds, wtih a worm-killing agent added, such as one spoonful turpentine or a dose of drenching mixture such as the arsenical or bluestone drench. The mixture can be dosed per rectum, and if repeated a week later will cause large numbers of the adult worms to be expelled.

(5) Two ounces arsenic, 6 lb. epsom salts, 4 oz. bluestone, 5 gallons water. To mix, bring 2½ to 3 gallons of water to the boil, then add the arsenic and epsom salts, and boil for forty minutes or until the arsenic is thoroughly dissolved. Dissolve the 4 oz. bluestone in one quart of water (glass, earthen, or enamel ware), and add to the arsenic and epsom salts when making up to the 5 gallons.

Dose.—

2 oz. for mature sheep,

1½ oz. for hoggets twelve to twenty-four months,

1 oz. for lambs six to twelve months.

This mixture was found to be most satisfactory for stomach worms as well as the nodule worm.

Prevention consists chiefly of change of pasture where possible. The sheep should not be allowed to drink from stagnant water, owing to the fact that they usually drink from the edges where the water is shallow and contaminated.

A suitable lick should be supplied which, according to results obtained from the South African experiments (*vide* Thirteenth and Fourteenth Reports) should contain two parts crushed dry tobacco leaf, two parts bone meal, one part kitchen salt, which, according to weight, would be 234 lb. bone meal, 52 lb. tobacco dust, 100 lb. salt. The mixture was slightly moistened when placed in the troughs.

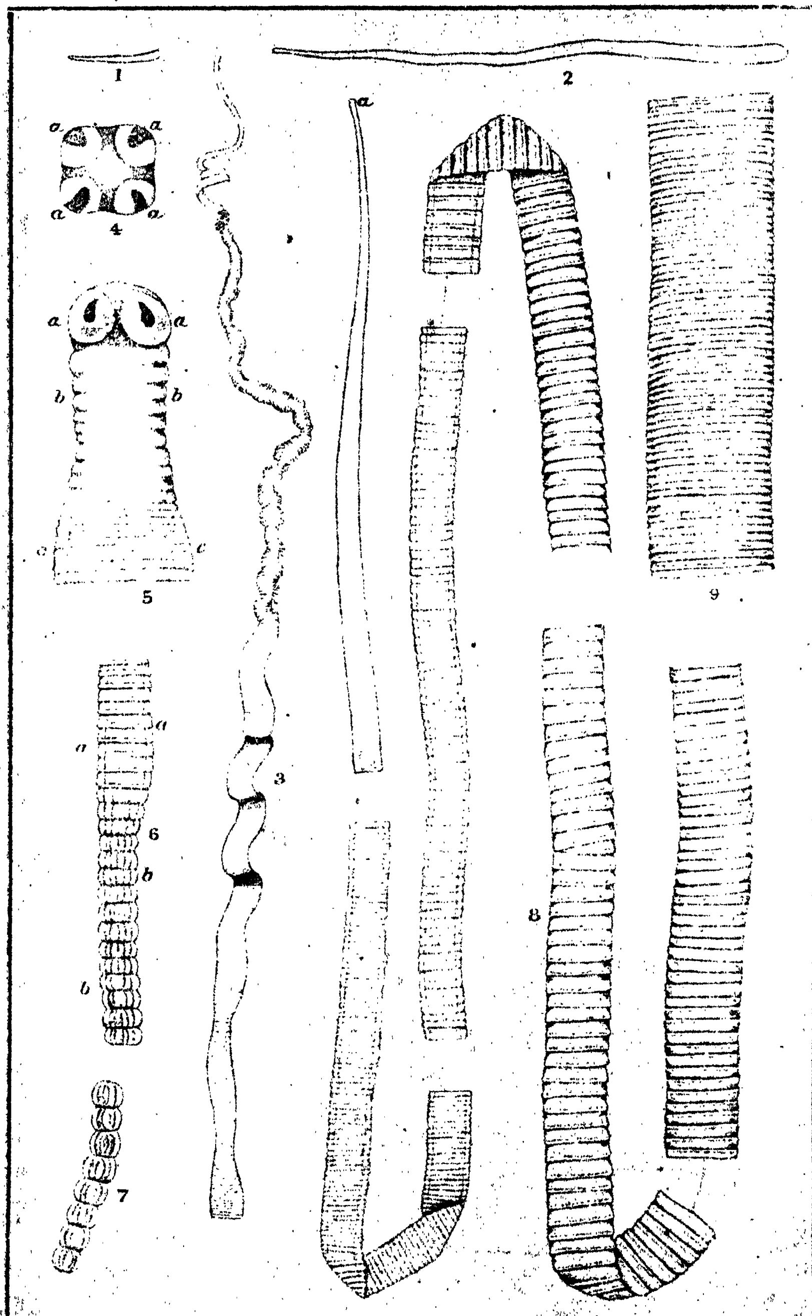


PLATE 164.—THE TAPEWORM (*Tænia expansa*).

Description of Plate 3.

Tape Worm (*Tænia expansa*).

Figures 1 and 2.—Young tape worm, natural size.

Figure 3.—Head end of tape worm drawn to show vermicular contractions when living.

Figure 4.—Head, top view. AA suckers or cups by which the worm attaches itself to the intestinal walls.

Figure 5.—Head, side view. AA suckers, BB folds in the back, CC the first segments.

Figure 6.—The large end of a young tape worm. AA segments which are not mature enough to drop off, BB segments ready to pass from the worm.

Figure 7.—Segments of proglottides found separate from the worm.

Figure 8.—An adult tape worm drawn in sections at regular intervals apart; a head.

Figure 9.—A segment of another worm which is not only slightly longer, but whose segments are shorter and broader.

The specimens shown in figure 8 could have assumed much the same shape when alive as figure 9.

Tape Worms.

Eight varieties are known to infest the bowels of sheep, and during the time they are harbouring them they will not fatten.

Once rid of them they are not likely to suffer another attack.

Symptoms.

When harbouring these worms the animals becomes unthrifty and hidebound. The wool is hard and harsh in quality. The animal appears stiff when moving, and generally hangs behind the flock when being driven. They produce emaciation, with paleness of the mucous membrane of the eyes, nose, mouth, &c. The functions of the digestive organs are impaired, the food being chewed irregularly, breath unpleasant. occasionally colic, tympany of abdomen, diarrhœa with mucous, in which is frequently found segments of the tape worms. If not attended severe infestation causes ultimate death from poverty and exhaustion.

Prevention.

Prevention consists in draining damp lands, stagnant water holes, &c., and by keeping uninfested sheep from known infested pastures.

The thorough cultivation of infested land is one of the most satisfactory means of destroying these parasites.

Treatment.

The regular drenching in the control of stomach and intestinal worms has an important influence in controlling tape worms.

Should these regular drenchings fail to create an improvement, a special drench can be given to those showing symptoms.

For lambs six months old—

Oil of turpentine, 1 dr.
Powdered arecanut, 25 gr.
Extract of male fern, 15 drops
Raw linseed oil, 1 oz.

Fast the lambs for eight to twelve hours before and for three hours after drenching. Repeat the dose for three weeks at intervals of seven days.

SCABBY MOUTH IN SHEEP (*Stomatitis*).

Stomatitis or Infectious Labial Dermatitis.

This affection is due to various causes, but is most commonly seen after wet weather when grasses are abundant and affected with fungi. Unless affected animals are treated in the early stages of development serious consequences may follow.

Treatment.

Dose for sheep—

3 oz. epsom salts,

1 teaspoon ground ginger,

½ pint water.

Dose for lambs—

1 oz. epsom salts,

½ teaspoon ground ginger,

3 oz. water.

Smear the affected parts with salad oil or grease if scabby, otherwise dress with either of the following:—

1.—

½ oz. chloride of potash,

2 oz. glycerine,

1 pint water.

Apply with swab.

2.—

1 tablespoon salt,

1 pint vinegar,

1 quart water, well mixed together, and swab.

3.—

1 lb. bluestone,

1½ gallons water.

Dip the muzzle into the mixture.

Blight.

There are three forms called blight—(1) Dietetic, caused by eating plants charged with irritating poisons, when a change of pasture is necessary, otherwise remove the cause. (2) Grass seeds. Remove the seeds, clean the eye, and wash with boracic water. (3) Real blight, pink eye. Make the following solution, and apply six drops daily:—10 grains sulphate of zinc, 20 grains boracic acid, 8 oz. boiled water.

The sheep should be isolated where good feed is plentiful and water handy.

Fine sugar is also a very useful agent used by being sprinkled into the eye.

Foot Rot or Foot Scald in Sheep.

This disease develops in most cases rather insidiously, and the animals retain their usual appetite. It begins with lameness, which is at first slight, and if not attended to, later becomes very intense. On examination, the coronet and lower part of the limb as high as the fetlock are found to be swollen. Upon a close examination an offensive discharge is discovered in between the claws.

Treatment.

The diseased sheep should be immediately separated and isolated from the healthy ones, and kept in a scrupulously clean and dry place. A foot bath should be constructed and filled with a solution containing 4 per cent. sulphate of copper. Through this the sheep are passed three times a week.

In cases where the feet are extensively diseased, the loose portions of horn should be removed. In mild cases where only a few sheep are affected, vaseline with 5 per cent. iodine can be applied daily to the affected parts.

Inflammation of the Udder (Garget).

If the feed is good at lambing time the flow of milk is also likely to be good, and if not taken away the udder becomes inflamed and swollen.

The best treatment is to give a purgative such as 2oz. epsom salts, 1 dr. ginger, in 4 oz. warm water.

Extract all milk possible, bathe the udder with hot water, inject a solution of carbonate of soda into the teats, and milk it out soon after. Dress the udder with embrocation. Repeat the treatment.

Hoven or Bloat.

This condition is set up when feed is plentiful and luscious, especially where clovers are abundant. If sheep are to be changed from a grass paddock into one likely to cause hoven, they should be allowed to fill as much as possible, then given a drink, and allowed on the luscious feed for a limited period, then taken off for two or three hours and put back to remain or repeat the short-period feeding for a few days before putting them on permanently.

Treatment.

When first development is noticed a dose consisting of one teaspoonful of bicarbonate of soda and an equal quantity of ground ginger in 4 oz. of warm water should give relief, otherwise the trocar direct into the rumen is the surest remedy. All extreme cases should be treated in this way.

Impaction.

Under dry conditions, when the grass is matured and hard or when sheep are being fed on scrub, impaction is likely to occur.

Treatment.

Two ounces castor and 2 oz. raw linseed oil and one teaspoon of aromatic spirits of ammonia or 2 oz. epsom salts in half a pint of warm water.

Prevention.

A good stock lick to be supplied during the time the sheep are on such hard feed.

Sheep Maggot Flies.

Parasites, either internal or external, render the sheep more prone to fly attack. Internal parasites, especially stomach and intestinal worms, are the worst offenders, as when they become troublesome they cause derangements of the digestive organs resulting in mild to severe scouring according to the severity of attack. This scouring will develop whether the sheep are on a scanty pasture or not, with the result that if flies are present the scouring sheep affords a suitable striking ground.

PLATE 165.

A FLY-STRUCK EWE.

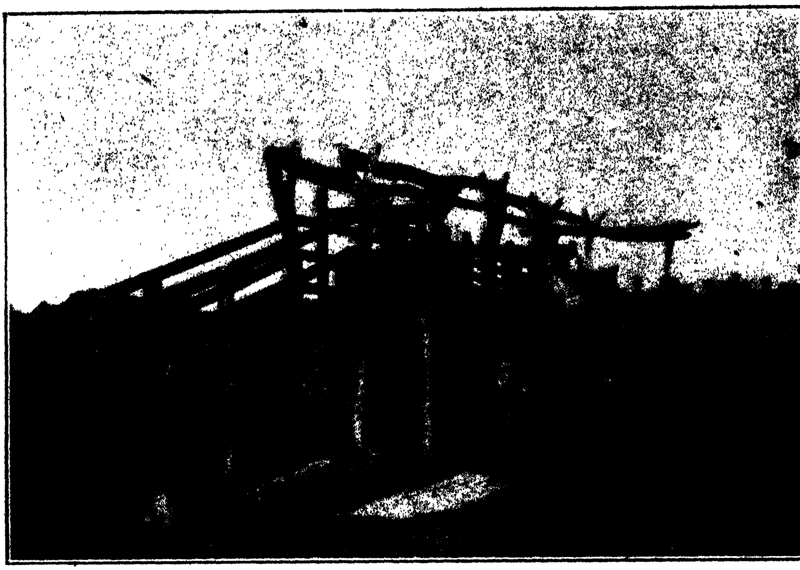


PLATE 166.—JETTING RACE, BARATRIA STATION.
Note hand raised to pull cord in closing swing gate. Total length of race 50 ft., width 16 in., height to 3 ft. 6 in.

PLATE 167.—JETTING SHEEP AT BARATRIA STATION.
Note hand on lever to open sliding gate.

If the feed is green and plentiful the excreta of the sheep is likely to become soft and adhere to the wool. If a few flies are about after the first rain an increase can be expected, but by the time they become numerous, if the dags are dry, no serious attack can be expected, but should a shower of rain fall and these dags become damp a serious attack may occur. Should the sheep be crutched, shorn, dipped, or jetted beforehand much trouble is saved, and probably no complete estimate of the advantage derived from the operation, whichever it may be, is noticed. Should the sheep be in half wool or longer when the attack occurs the quickest way of giving protection is the most satisfactory, as once a sheep is struck other flies are attracted, probably resulting in a severe infestation in a few days.

Any mustering where clean sheep are brought into contact with those that are blown only encourages further trouble unless the maggots and flies are destroyed or the sheep protected.

Jetting or dipping, if properly done, will kill the maggots on the sheep as well as poison many of the flies that are attracted by the moisture in the wool. The two chief points to be considered are to see that the poisoned liquid penetrates to the skin and that it is of the desired strength. Jetting is performed by forcing the prepared liquid through a nozzle into the crutch of the sheep.

The area that should be jetted as a safeguard against the attack of the fly should be over a space extending from above the tail and carried down at each side of it to the crutch, which should take in all the stained portion. Length of wool or the presence of dags do not matter, provided the mixture is forced to the skin. The long wool will hold more poison, thus giving a greater amount of protection. Sheep that are struck should be crutched and hand dressed, or jetted without being crutched. When the sheep are returned to their pasture, if time permits, those showing distress can be given any further treatment that is necessary. If the wool is removed the usual force of jet would be too severe, and cause injury if not death. A hospital paddock should be set aside for all affected sheep; this for two reasons: firstly, to save travelling and hold them in a convenient paddock, and, secondly, once a sheep is struck it is more subject to further attack, and is best kept out of the healthy flock.

The Committee of Investigation under the Council for Scientific and Industrial Research who conducted the experiment at Dalmally, 1918 to 1921, concluded that jetting with a solution consisting of 7 lb. arsenic with an equal quantity of carbonate (washing) soda to 100 gallons of water gave 90 per cent. protection for three months. The weather at and after jetting is an important factor, but it is regarded that the quantity of arsenic in the wool of the breach is the ingredient giving protection. Many dip mixtures are on the market, those containing arsenic being the most effective in protecting sheep.

The pressure necessary varies according to the length of wool from 160 lb. per square inch for sheep carrying eight months' wool to 60 lb. per square inch for crutched or shorn sheep. Jetting in an ordinary race is not so satisfactory as where the sheep are in a raised race. The upward tendency when applying the jet is a decidedadvantage, besides which the surplus mixture which falls from the wool can be recovered. This, on analysis, loses very little strength. Where small numbers are to be treated a hand pressure pump will be sufficient, but in dealing with large numbers a power plant is the most suitable.

When investigating the fly trouble in the Central West the weight of evidence was in favour of jetting. Mr. Barton, Baratria Station, states that, provided the jetting mixture is correct and properly applied, he has every confidence in its being the best means in protecting large flocks of sheep. On Baratria Station there are three elevated races erected which are the cheapest, simplest, and most economically worked that I have seen in use, and quite as efficient as any other style for thorough application. It is 50 ft. in length and 3 ft. 6 in. above ground level at the highest point just ahead of where the sheep is jetted. It is fitted with two sliding and one swing gate. This swing gate forms part of the side of the race. When the sheep passes this swinging gate the sliding gate is pushed across the race to hold it while being jetted. (Plate 166.) When the sheep is jetted the jet operator opens the sliding gate with his left hand by means of a long lever, and at the same time opens the swing gate. The jetted sheep, seeing the opening in the race and also the jetted sheep in the yard, moves away and is followed by the next sheep, the sliding gate being pushed back to keep it in position while the swing gate is drawn back across the race by means of a rope by the man whose duty it is to keep the sheep up to the jetter. This swing gate (Plate 167) holds the next sheep back and at the same time gives the opening in the side of the race to the jetter to work the nozzle which should be a straight jet.

The race is 16 in. wide, inside measurement, and is floored with battens 3 in. by 1½ in., spaced ¾ in. apart. The uprights in use were 3 by 2 in. hardwood, as were also the sleepers to carry the crosspieces in the race. The ramp is 14 ft. in length, starting at the forcing yard at 6 ft., narrowing down to the race 16 in. wide. Bush timber for uprights would be suitable, as also for sleepers to carry the crosspieces in the race. These latter, as well as the crosspieces in the ramp, could also be split bush timber. While present, Mr. Barton jetted one hundred sheep in twenty-five minutes, having four men keeping the sheep up to him.

If jetted sheep are blown the poison in the wool controls the growth and spread of the maggot.

Dipping.

This is another means by which both maggots and flies can be controlled and the sheep protected for several weeks.

The strength of the mixture should be at the rate of 2 lb. arsenic to 2 lb. carbonate of soda per 100 gallons of water when the wool is up to four months' growth. When the wool is longer the strength can be reduced to 1½ lb. at nine months' growth, but the longer the sheep must stay immersed.

Crutching also is an advantage, and to a great extent assists in protecting the sheep, as 90 per cent. are likely to be struck about the crutch. In yarding and crutching only the sheep already struck more harm than good is likely to be done, as mustering clean sheep and bringing them in contact with those that are blown usually causes a further spread of the trouble.

In crutching there is no attempt to deal with the fly, and it often happens that a few weeks after crutching 20 per cent. of the flock will be suffering from a fresh attack. As the maggots develop they do not find sufficient covering in the crutched part, with the result that they spread to the long wool. Their presence in the body wool soon induces flies to that part, where further trouble is generated.

If crutching is practised midway between shearings good must result, especially where ewes are treated, as by the time shearing comes on there is a sufficient length of wool to be properly shorn, but if the wool is short it is often missed, with the result that many sheep are turned out prone to a fresh attack at no distant date.

Swelled Head in Rams.

Several reports from various parts of Australia indicate that this affection is widespread.

In Queensland a few cases showing similar symptoms were reported, but whether the complaint was of the same origin is not known. The cause of this complaint was unknown until recently, when Dr. L. B. Bull, Bacteriologist to the Adelaide Hospital, appeared to have solved the problem when investigating the disease.

He states that the disease is caused by the presence of a minute bacillus or germ which was found under the skin of the swollen tissues of the head.

Tetanus or Lockjaw.

This is caused by the presence of a germ picked up, usually from the soil.

Prevention is better than curative treatment, although the idea that the disease is always fatal is not correct, as many so affected recover without aid. All wounds at shearing or lamb marking should be treated with a good disinfectant.

All tools should be dipped in some good disinfectant before and during the time they are in use.

Shearing sheds and yards should be treated with a strong antiseptic solution.

Lamb marking in old yards should be avoided if possible, and lambs marked in temporary yards in order to allow them being placed on clean ground after marking.

Symptoms.

Grinding the teeth, stiffness, difficulty in swallowing, twitching of the muscles of the face, projected eyelid, followed in final stages by stiffening of jaws, quivering and general stiffening of the muscles, panting, rapid and short pulse beats.

Anti-tetanic serum injected under the skin at or just previous to shearing will safeguard valuable animals against the action of tetanus germs.

Should sheep die from this complaint they should be completely burned as soon as possible.

Pizzle Disease (Balanitis).

This trouble is usually found amongst merino wethers which while suffering from it are not likely to put on flesh. Cases are found which are quite local, caused by grass seeds and dirt, but the usual cases are those where irritation is caused by an accumulation of corruption blocking the opening.

In some districts this disease becomes very serious, and carries *bacillus necoisis*, and seems to be a common complaint amongst aged wethers in many districts.

In mild attacks cleaning the opening of the sheath and disinfecting same may be sufficient, but in the cases where an abscess has formed, all wool should be cleaned away and the sheath completely opened until the pizzle is exposed. Clean away all corruption and apply a strong salt solution, a 2 per cent. bluestone solution, or a proprietary disinfectant, many of which are on the market.

Cheesy Gland Disease (*Caceous lymphadenitis*).

This is a disease that affects the glands of sheep, and is caused by a special microbe or bacillus, Preisz-Nocard, to which the Council of Scientific and Industrial Research has been giving much attention during recent years. This disease does not impair the health of the sheep to any great extent, but from an economic point of view it is of great importance to our sheep breeders, as all carcasses showing diseased glands are rejected for export. The glands most frequently affected are those situated in the shoulders, flanks, and thighs. Infection occurs through wounds, and may be transferred in the process of shearing when glands are ruptured with the comb of the machine, after which the pus may adhere to the comb, the shearers' clothing, or drop on the shearing board or in the counting-out pen.

Whenever it is noticed that an abscess has been opened in shearing or that the machine has become contaminated by passing over an abscess already discharging, they should be cleaned and disinfected. Lamb marking should, as far as possible, be practised on grass land in temporary yards and dropped carefully, feet downwards, on the grass after being disinfected. Investigations up to the present time point to the process of shearing as introducing the greatest percentage of infection in Australia. This is important, and indicates that great care should be exercised in the grinding of combs, leaving the points as full as possible, when they would be less liable to puncture the skin, and also to the advantage likely to be gained by disinfecting the sheep as soon as possible after shearing, probably when leaving the counting-out pens. The shearing board and yards should be disinfected at least before and after shearing, and the lambs shorn first.

Investigations are still in progress.

Sheep Skins.

On many holdings sheep are killed for rations. In such cases they should be skinned carefully and the skin hung in the shade to dry.

When dry, they should be painted with a mixture to protect them from the attack of the weevil or moth the larvæ of which does considerable damage. Make a mixture by boiling 1 lb. arsenic and 1 lb. washing soda in 2 gallons of water, and paint the flesh side of the skin while the mixture is still warm; or boil 3 lb. sodium sulphate in 1 gallon of water for twenty minutes, and paint while lukewarm. If skins are properly removed and cured they will retain their value for a considerable length of time.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of The Jersey Cattle Society, The Australian Illawarra Shorthorn Society, and The Friesian Cattle Society, production charts for which were completed during the month of September, 1932 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
	JERSEY.	Lb.	Lb.	
	MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.			
Bellefaire Twylish's Bellette	F. J. Cox, Imbil	8,000·45	467·61	Werribee Prince Twylish
Lady Crocus	J. Nicol Robinson	7,953·4	396·713	Retford Statesman
Lily of Calton	F. J. Cox, Imbil	6,392·3	374·345	Retford K.C.
Little Lettie of Burnleigh	W. Mallett, Nambour	6,652·6	353·428	Trinity Baron
	SENIOR, 4-YEAR OLD (BETWEEN 4½ AND 5 YEARS), STANDARD 330 LB.			
Maria of Armley Park	Hurst Brothers, Nerang	6,205·41	356·618	Avondale Golden Ferns Noble
	JUNIOR, 4 YEARS OLD (BETWEEN 4 AND 4½ YEARS) STANDARD 310 LB.			
Yimmin Bright Lass	R. A. Anderson, Yandina	5,564·25	324·603	Yimmin Starbright King
	SENIOR, 3 YEARS OLD (3½ TO 4 YEARS), STANDARD, 290 LB.			
Nightshade of Rosedale	Wakefield Bros., Upper Barron	5,663·2	341·659	Oxford Prince Palatine
Mabel of Brook Lodge	H. T. Mayers, Nambour	5,321·87	324·268	Waimate of Brooklodge
	JUNIOR, 3 YEARS OLD (BETWEEN 3 AND 3½ YEARS), STANDARD, 270 LB.			
Newhills Princess	J. Nicol Robinson, Maleny	6,048·45	399·885	Prince Harry of Newhills
Carnation Queenie (266 days)	Spresser and Sons, Brassall	4,469·5	281·85	Carnation Renown
Winsome Lassie 2nd of Peachester	D. Mcdonald, Peachester	4,728·95	275·018	Trinity Roadside
	SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB.			
Trecarne Rosebud	T. A. Petherick, Lockyer	5,229·95	273·019	Trecarne Sultan
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Seycombe Gaiety	A. E. Trigger, Didcot	4,345	306·142	Upwell Prime Minister
Maybelle of Avonmore	R. C. Murdock, Cooroy	4,578·1	258·919	Prince Palatine of Cooroibah
Newhills Pearl (265 days)	J. Nicol Robinson, Maleny	4,049·91	256·027	Newhills Mascot
Carmilla of Peachester	D. Macdonald, Peachester	4,768·4	253·314	Trinity Roadside
Carnation of Cooroibah	Hurst Brothers, Nerang	4,489·25	239·041	Laddie of Cooroibah

AUSTRALIAN ILLAWARRA SHORTHORNS.

MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Westbrook Lark 3rd	W. F. Kajewski, Glencoe	10,332·93	450·232	Sheik of Upton
Gem 4th of Oakvilla	H. Marquardt, Wondai	9,364·06	397·558	Victory of Greyleigh
Daisy 8th of Oakvilla	H. Marquardt, Wondai	9,956·32	390·238	Victory of Greyleigh
JUNIOR, 3 YEARS OLD (BETWEEN 3 AND 3½ YEARS), STANDARD 270 LB.				
College Gold	Queensland Agricultural High School and College, Gatton	6,909·94	282·673	Fussy's Kitchener of Hillview
Phyllis of Murray's Bridge	Hemmings Bros., Murray's Bridge	7,116·25	281·934	Valiant of Greyleigh
SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB.				
Lilac 2nd of Rosenthal (365 days)	S. Mitchell, Warwick	9,386	382·302	Sunrise 3rd
Bella 19th of Fairlie	C. B. Mitchell, Warwick	8,420	334·265	Dividend of Rosenthal
Glenroy Pearl	W. F. Kajewski, Glencoe	6,917·03	301·819	Brilliant 2nd of Oakvale
College Ida	Queensland Agricultural High School and College, Gatton	6,866·95	289·76	College Heir
Crimson of Glendalough	Hickey and Sons, Wilston	7,326·89	262·263	Don of Springdale
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
The Glen Orange	A. C. Stewart, Coondoo	6,896·85	298·188	Lorna's General of Arley
Pensive of Glen Cairn	H. M. Graham, Goomeri	6,551·06	280·417	Nelson of Darbalara
College Vira	Queensland Agricultural High School and College, Gatton	6,662·67	240·766	Fussy's Kitchener of Hillview
Sunbeam of Trevor Hill	G. Gwynne, Umbiram	6,635·8	239·977	Illawarra II. of Mayfield
Fairy 6th of Fairlie	C. B. Mitchell, Warwick	5,652	233·902	Auditor
Doris of Glen Cairn	H. M. Graham, Goomeri	6,282·18	230·945	General of Croydon

FRIESIAN.

SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB.				
Oaklands Beauty Rock	W. Richters, Tingoora	6,892·01	272·907	Pied Rock

STOCK FEE[illegible]

By E. H. GURNEY, Senior A[illegible]

OWING to the low price now obtaining for all pr[illegible] and it is imperative for the stock feeder to consider wh[illegible] disposal of obtaining nutritious food for his stock, at a[illegible]

Our climate is such that at certain periods of the year [illegible] large supplies of natural grasses, which in the young stage of [illegible] and may be considered as the best and cheapest single stock foo[illegible] owing to the climatic conditions, these grasses very quickly reach an [illegible] of maturity, at which stage they can only be considered as roughage [illegible] very little nutriment. Therefore, when grass feeding is largely depended [illegible] times of winter or drought grass scarcity it is necessary for the stock fee[illegible] consider what under his conditions are the most economical means to be taken [illegible] obtain supplies of nutritious feed stuffs.

If such additional feed stuffs are not given the productive ability of the animal, obtained in time of plentiful grass supply, is arrested, and the maintaining of any animal at less than its true productive power cannot be considered economical at any time, but more particularly is this the case when low prices obtain for animal products.

The aim then is to obtain feed material at a cost which will be covered by the returns from the animals, with which returns the advantages gained by not allowing the general health and condition of the stock to run down must be taken into consideration.

The cheapest foodstuffs are those grown upon the farm, but what particular foodstuff should be grown, and in what condition fed must be left for decision by the individual stock feeder. But in districts where dairy farming is conducted the great losses which occur through winter grass scarcity could be to a large extent reduced if one of the methods or combinations of methods for feed production mentioned below, was followed, viz.:—

The cultivation of lucerne to be fed green or as hay.

Cultivation of such crops as maize, sorghum, cow-cane, &c., to be fed green or as silage.

Subdivision and improvement of pastures and fertilizing, excess pasture growth to be stored as hay or silage.

Objects of Feeding.

Food is required by the animal in order that the digested portion may be used as material for building up the different organs of the body, and for the replacement of such as they become worn out.

Food is also required as a source of heat and energy. These are supplied by the oxidation of some of the food ingredients, and the heat and the energy produced by this process of slow combustion are used to maintain the body temperature, and to perform work such as locomotion, digestion, blood circulation, &c.

Constituents of Foods and their Functions.

The constituents of foods are classified under the following groups:—Moisture, Protein, Fat, Carbohydrate, Fibre, Mineral Matter, and Vitamins.

Moisture.

All foods contain moisture in varying amounts, but as the animal body consists of water to the extent of about two-thirds of its weight, water must form a separate portion of the food.

Proteins.

The nitrogenous matter in foodstuffs is mostly protein. The proteins are complex substances which always contain carbon, hydrogen, oxygen, and nitrogen, and usually contain sulphur and frequently phosphorus, the nitrogen content being approximately 16 per cent.

The proteins are formed by the combining together of a number of simpler bodies called amino-acids.

* In a radio lecture from 4QG.

During digestion the insoluble proteins are converted into these soluble amino-acids, which are then passed through the walls of the stomach and intestines into the circulating blood, which carries these amino-acids to different parts of the body, where they are recombined to form the particular protein required. About twenty amino-acids are known.

Plants, from material obtained from soil and air, can build up these amino-[illegible] For live stock [illegible] would appear advantageous to be supplied with food [illegible] all the different amino-acids required for building up the protein of [illegible] body.

The proteins of foodstuffs vary very much in so far as they may be composed [illegible] different amino-acids, and therefore by feeding live stock with different foodstuffs there is less chance of any required amino-acid being absent.

Proteins are utilised by animals for the formation of flesh, muscle, and blood, and hence for quick growth to take place an ample supply of protein must be present in the feed.

This fact is well illustrated by the analyses of the milk of different animals. Thus, mare's milk contains 1.8 per cent. protein, and the colt doubles its weight in 60 days; cow's milk contains 3.5 per cent. protein, and the calf doubles its weight in 47 days; whilst sow's milk contains 7.2 per cent. protein, but the young pig takes only 10 days to double its weight. Thus it is seen that quickness of growth is provided for by increased protein content in the mother's milk.

From this it will be seen why young stock should always be fed with what is termed a "narrow" ration, that is a ration in which the protein content is relatively high compared with the amount of other nutrients present.

If protein in an excess amount is fed it is broken down into amino-acids which are carried by the blood to the liver, where they are deprived of their nitrogen and converted into carbohydrates and fats, and the separated nitrogen ultimately converted into uric acid and urea, these substances being ejected by the kidney.

Protein being the most expensive nutrient to buy, it should be the aim of the feeder to supply a sufficiency of protein for the particular purpose desired, but any excess is wasteful, both from the monetary point of view, and the unnecessary energy required from the abovementioned organs. In fact, a very excessive amount of protein may cause disease.

Carbohydrates.

These substances contain carbon, hydrogen, and oxygen, the two latter elements in the same relative proportions as found in water. Such substances as sugars, starch, and cellulose are carbohydrates. The fibre of food stuffs is chiefly cellulose. During digestion the more complex sugar and starches are broken down into simpler sugars, which are absorbed into the blood through the walls of the intestines. These simpler sugars combine with the oxygen of the blood, being converted into Carbon Dioxide and water, this process of oxidisation yields heat and energy required for functions of the body. Excess carbohydrate is stored in the body as fat or glycogen (animal starch) in the muscles and liver, such storage being drawn upon if required.

It has already been stated that proteins can be used by the animal to replace carbohydrates, but carbohydrates cannot replace protein.

Fats and Oils.

These substances are compounds of carbon, hydrogen, and oxygen, being known as fats when in the solid form, and oils when in the liquid form at ordinary temperatures. They contain very much less oxygen than carbohydrates, as they contain about 11 per cent., whereas carbohydrates may contain from 49 to 53 per cent. For this reason the fats are capable of being oxidised to a greater extent than the carbohydrates and so have a higher value for production of animal heat and energy than the carbohydrates.

Mineral Matter.

It has long been known that mineral matter is required to build up the skeleton of the animal body, but from more recent research it has been shown that it is also necessary for the fluids of the body to contain a certain amount of mineral matter in order to obtain correct bodily functions. The mineral matter of foodstuffs influences the digestion, growth, health, and productive power of animals.

Though it is known that such minerals as ... sium, iron, and others are required by the animals, not m... t ... with the relative proportion in which the minerals ... Jew ... eficial. Referring again to the milk of different anima ... he ... the mineral matter of these milks contain high percent ... d lime, and of particular interest is the fact that the ... ingredients is practically the same.

VITAMINS.

It has been demonstrated that a food containing all the nut... mentioned in correct proportions and with suitable mineral matter, ... able to promote growth and reproduction if certain accessory food sub... absent. Such substances are called "vitamins," and at least five of these ... are known, and they are distinguished by the first letters of the alphabet.

Vitamin A (or Fat Soluble A).

This vitamin is synthesised (built up) by plants, and is found in green foods such as lucerne, green grass, and in some seeds such as yellow maize, millet. This vitamin is not present in white corn, white leaves of plants, or in most root crops, though carrots contain it in considerable quantities.

Other sources of this vitamin are cod liver oil, butter fat, egg yolk, and fat.

Animals cannot synthesise this substance in their bodies, but must obtain it already built up in their food; but they have the ability to store it in their fat.

As this vitamin is necessary for growth, young stock must be well supplied with it, and if lacking in the food an adult animal is more liable to be affected with disease.

Vitamin B (it would appear that this is composed of two vitamins).

This is a disease preventing factor, and it induces growth. It is found in the germ and bran of all grains, in yeast, and in most foodstuffs.

Vitamin C.

Found in oranges, lemons, fresh green leaves, and fruits. It prevents the occurrence of scurvy.

Vitamin D.

This vitamin occurs with vitamin A in cod liver oil, and it occurs in a few other animal fats. This vitamin has the power to cure and prevent the bone disease called rickets.

A deficiency of lime and phosphoric acid in the feed will cause rickets, but even with a sufficiency of these minerals in the diet in the absence of Vitamin D or certain light rays these minerals will not be deposited, or are deposited in insufficient amounts on the growing bone. Certain rays of the sunlight called ultra-violet rays, which rays may also be produced by a quartz mercury vapour lamp, have the power of acting upon the animal body and in some way changing some body substance into Vitamin D.

Vitamin E.

Appears to be associated with the reproductive organs, and if deficiency occurs the breeding powers are lessened.

It is contained in the green leaves of plants, and in germs of seeds such as wheat germ, and materials of this nature should be included in the diet of breeding stock.

From what has been stated it would appear that stock having green grass or green fodder in sufficient amounts will not be liable to have trouble through vitamin deficiency.

But where stock are fed on rations without green stuff, feeds known to contain vitamin should be included in the rations. Cod liver oil has improved the growth of calves when they are reared on milk substitutes.

Answers to Correspondents.

Cement Covering for Iron Roofs and Walls.

INQUIRER (Kingaroy)—

Mix thoroughly enough cement with fresh skim milk to bring it to the consistency of ordinary oil paint and apply with a whitewash brush.

This wash dries quickly, and will not be affected by rain after an interval of fifteen minutes has elapsed from the time of its application.

This treatment reduces the temperature within the building treated, improves its appearance, and increases the life of the iron. Colour may be added to the wash if desired.

General Notes.

Staff Changes and Appointments.

Mr. N. C. Copeman, Inspector of Stock, Kingaroy, has been appointed also an Inspector under the Brands Acts.

Messrs. W. H. Hitchins (Nambour), M. Thom (Palmwoods), W. J. Suarea (Beerburrum), P. Hicks (Dagun), W. Lazenby (Amamoor), H. C. Grigg (Cleveland), and E. E. McNall (Woombye), Loaders for the Committee of Direction of Fruit Marketing, have been appointed also Honorary Inspectors under the Diseases in Plants Acts.

Mr. C. C. Barth, Inspector of Stock, Gayndah, has been appointed District Inspector of Stock, Longreach.

Mr. H. K. Lowcock, Temporary Assistant Pathologist, Department of Agriculture and Stock, has been appointed Assistant Pathologist, Department of Agriculture and Stock.

Messrs. H. Lingard and G. W. Gaynor, of Palmwoods, have been appointed Honorary Rangers under the Animals and Birds Acts.

Constable J. F. Fallon, Kumbia, has been appointed also an Inspector under the Slaughtering Act.

Mr. C. N. Morgan, Agent under the Banana Industry Protection Act, Cooroy, has been appointed an Inspector under the Diseases in Plants Acts, The Summit, via Stanthorpe.

Council of Agriculture.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts, which will empower the Minister for Agriculture and Stock, upon the recommendation of the Executive Committee of the Council of Agriculture, to appoint a member to fill a vacancy which may occur on the Executive Committee. No procedure is provided at present in the Regulations in connection with the filling of vacancies on the Executive in between meetings of the Council of Agriculture, and the new Regulation will accordingly make such provision.

Plain Turkeys Protected in the North.

An Order in Council has been issued under the Animals and Birds Acts, which provides that the Bustard or Plain Turkey shall be protected throughout the whole year in the Shire of Eacham. At present, the period of protection in the North is from 1st November to the 31st May. The Plain Turkey is a big asset on the Atherton Tableland, and lives practically on grubs and insects. These pests do a considerable amount of harm in the district, and it is considered that the period of partial protection is not sufficient to safeguard this valuable bird.

Pseudo Poultry Plague.

Advice has been received by the Depar[illegible]k of a fresh outbreak of Pseudo Poultry Pleague (o[illegible]y) in Victoria. About two years ago, this disease, wh[illegible]nown to exist in Australia, was found amongst poultry in [illegible]en by the Queensland Department to safeguard the pou[illegible] issuing a Regulation which provided that the owner of [illegible] was required to deliver to the Inspector at the place of [illegible] that the birds were free from disease and had not been in [illegible] poultry for the preceding three months; a certificate from [illegible] whence the birds had come to the effect that he had examined [illegible] a certificate from the Chief Inspector of Stock or Chief Veterinary [illegible] State from which the poultry came to the effect that there had been [illegible] of pseudo poultry plague in that State during the preceding twelve mo[illegible] that such birds were the product of the State or had been in the State for [illegible] twelve months. The person introducing poultry had also to deliver a perm[illegible] import, issued by the Poultry Expert of the Department of Agriculture and Sto[illegible] Brisbane.

In July, 1931, the Southern States were declared free of the disease, and the restrictions against the introduction of poultry were lifted, the Regulation which had been in force prior to the outbreak being reverted to. However, following upon this new outbreak of pseudo poultry plague, similar precautions are again being taken, and a Regulation has been issued recently embodying the same principles as those which were enforced following on the notification of the first outbreak of this disease.

Queensland Cane Growers' Council.

Executive approval was given to-day to an amendment of the Queensland Cane Growers' Council Regulations, which will provide that, in future, cheques drawn on the Defence Fund Accounts of the Council shall be signed by the Chairman, Secretary, and one other member of the Council. Previously, it was necessary to obtain the signatures of two other members of the Council in addition to those of the Chairman and Secretary.

Sanctuary at Koumala.

"Tedlands," Koumala, the property of Mr. C. Heron, has been declared a sanctuary under the Animals and Birds Acts, and it will be an offence for any person to take or kill any animal or bird on this property. Mr. Heron has been appointed an Honorary Ranger for this sanctuary.

Rural Topics.

Biblical Farming.

Concerning the farming of the Jews, we find there are many incidental remarks in the books of the Old Testament. On the conquest of Canaan, it appears that the different tribes had their territory assigned them by lot; that it was equally divided among the heads of families, and by them and their posterity held by absolute right and impartial succession. Thus every family had originally the same extent of territory; but, as it became customary afterwards to borrow money on its security, and as some families became indolent and were obliged to sell, and others extinct by death without issue, landed estates soon varied in point of extent.

In the time of Nehemiah, a famine occurred, on which account many had "mortgaged their lands, their vineyards, and houses, that they might buy corn for their sons and daughters; and to enable them to pay the king's tribute." (Nehem. v. 2.) Some were unable to redeem their lands otherwise than by selling their children as slaves, and thereby "bringing the sons and daughters of God into bondage."

Boaz came into three estates by inheritance. Large estates, however, were not approved of. Isaiah pronounces a curse on those "that join house to house, that lay field to field, till there be no place, that they may be placed alone in the midst."

While some portions of land near the towns were enclosed, the greater part was in common, or in alternate proprietorship and occupation, as in our common fields. This appears both from the laws and regulations laid down by Moses as to herds and flocks; and from the story of Ruth, who, to procure sustenance for herself and her widowed mother-in-law Naomi, "came and gleaned in the field after the reapers, and her hap was to light on a part of the field (that is, the common field) belonging unto Boaz."

The crown-lands in King David's time were managed by seven officers; one was over the storehouses, one over the work of the field and tillage of the ground, one over the vineyards and wine-cellars, one over the olive and oil-stores and sycamore plantations, one over the herds, one over the camels and asses, and one over the flocks.

King Uzziah "built towers in the desert, and digged many wells; for he had much cattle both in the low country and in the plains; husbandmen also and vine-dressers in the mountains, and in Carmel, for he loved husbandry."

Even private individuals cultivated to a great extent, and attended to the practical part of the business themselves.

WHAT ELIJAH FOUND.

Elijah found Elisha in the field, with twelve yoke of oxen before him, and himself with the twelfth. Job had 500 yoke of oxen, and 500 she asses, 7,000 sheep, and 3,000 camels. Both asses and oxen were used in ploughing; for Moses forbade the Jews to yoke an ass with an ox, their step or progress being different, and, of course, their labours unequal.

Among the operations of agriculture are mentioned watering by machinery, ploughing, digging, reaping, threshing, &c. "Doth the ploughman ploughe all day to sow? doth he open and break the clods of his ground? When he hath made plain the face thereof, doth he not cast abroad the fitches, and scatter the cummin, and cast in the principal wheat, and the appointed barley, and the rye, in their place?" The plough was probably a clumsy instrument, requiring the most vigilant attention from the ploughman; for Luke (ch. ix. 62) uses the figure of a man at the plough looking back, as one of utter worthlessness.

Covered threshing-floors were in use; and, as appears from the case of Boaz and Ruth, it was no uncommon thing to sleep in them during the harvest.

Corn was threshed in different ways. "The fitches," says Isaiah, "are not threshed with a threshing instrument, neither is a cart-wheel turned about upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod (flail). Bread corn is bruised, because he will not ever be threshing it, nor break it with the wheel of his cart, nor bruise it with his horsemen." The bread corn here mentioned was probably the fare of the Romans (maize), which was commonly separated by hand-mills, or hand-picking, or beating, as is still the case in Italy and other countries where this corn is grown.

Corn was "winnowed with the shovel and with the fan." Sieves were also in use, for Amos says, "I will sift the house of Israel, as corn is sifted in a sieve." Isaiah mentions the "digging of hills with the mattock"; to which implement the original pick would gradually arrive, first, by having the head put on at right angles, and pointed; next, by having it flattened, sharpened, and shod with iron.—"Live Stock Journal" (England).

Relative Food Value of Grain.

Experiments carried out at Hawkesbury Agricultural College in 1929 showed that even at 5s. 6d. per bushel the feeding of wheat to pigs was profitable. American experience in feeding wheat to lambs is that they made the same gains as those fed on maize, and only required 2 per cent. more grain and hay for each 100 lb. gain. Wheat is slightly better than barley for lambs, and less of it is required for 100 lb. gain in live weight. English experiments with lambs confirm American results. In America it has been shown that good quality wheat is worth as much as maize for feeding pigs. In Ireland pigs fed on wheat gave much better results than those fed on bran and pollard.

Wheat is a suitable feed for calves, fattening cattle, and dairy cows. For dairy cows in Denmark ground wheat was fully equal to mixed barley and oats. Provided the price is low wheat can also be fed with economy to horses.

Grass Our Most Valuable Crop.

In the final analysis, pointed out the Agr... ...Wales Department of Agriculture in a recent address... ...our most important crop. The Commonwealth statis... that whereas the value of production from agricu... the value of that of the pastoral industry was £84,5... dairying was approximately £49,500,000, and the pastur... least 75 per cent. of that amount.

Not only was pasture our greatest wealth-producing crop... realised that its character and money-making ability were partic... to control by scientific management. Sheep producing high quality... cows in high production, ewes rearing export lambs, animals being ... market, and particularly those bred for the production of early maturing... required feed of a highly nutritious nature, and the aim of the producer should... to supply the animals with the best of pastures as to quality and, at the same tim... to carry the maximum number of stock on the holding. For maximum production, animals must have access to pastures which contained palatable and persistent types of pasture species most suited to the particular locality, and the areas must be efficiently managed and treated with suitable fertilisers to make up for the depletion of soil fertility which was going on continuously wherever animals were grazed.

The use of the best strains of pasture plants would result in greater value being obtained from plant food applied in the form of fertilisers, because the good strains of grasses and clovers, like good quality stock, would make better use of the food supplied than would the inferior ones.

Care should be taken not to overstock; stock would always pick out the most palatable and nutritious plants in a pasture first, and, if overgrazing occurred, the good grasses and clovers would be weakened and ultimately disappear from the sward.

The Defective Cream Can Reduces Profits.

Dairy farmers should see that their milk and cream cans are in a condition fit to contain these products. It is not sufficiently recognised that old rusty, broken or dented cans may be responsible for a large percentage of the objectionable taints that occur in cream and milk.

A rusty surface on the inside of a can is one of the chief troubles, but one which in many cases can be very easily remedied by re-tinning. When cream or milk comes in contact with rust patches, it is very likely to develop a metallic or a tallowy flavour, both of which are very objectionable taints for the butter-maker. If the rust is allowed to remain for any length of time, the surface will become badly pitted, and traces of milk and cream will lodge in the uneven face, with the result that harmful bacteria will rapidly develop and the fresh cream will be immediately infected and more than likely badly contaminated before it can be treated at the factory.

Cans which are badly dented, especially round the shoulders, it is often almost impossible to clean thoroughly without a great amount of trouble, and they should, therefore, be attended to immediately they are damaged. Broken necks and lids are objectionable, as they allow stale cream and milk to collect and contaminate the fresh cream. All loose bands, &c., should be thoroughly soldered up to prevent dirt, &c., collecting under them, since, although the milk or cream may not come in direct contact with this part of the can, objectionable bacteria will develop and may often contaminate the contents indirectly.

Although some jobs are best sent to a tradesman, a soldering outfit is a handy adjunct on the dairy farm, as there are many repairs that the farmer can do quite effectively for himself.

It is very false economy for the farmer to use for storing or carting of milk and cream a can exhibiting any of the defects mentioned.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

TOMMY REFUSES HIS DINNER.

TOMMY has always had a good appetite for his meals. His refusal comes as a surprise, nothing of this sort has ever happened before. What is his mother to do about it? If she is a wise woman she will not make a fuss about it, nor even give him a dose of castor oil, but will just do a bit of quiet thinking. Unfortunately there are many women who in such an emergency will do the worst thing possible. The unwise mother may coax or bully Tommy into eating what he had at first refused. This will do Tommy no good, and may make him a very sick boy.

Perhaps Tommy is not well. Have a good look at him. Is he feverish? If you have a thermometer, there is no harm in using it now. Does he look his usual self? Or is he stupid and heavy or excitable and irritable. Has he a cough or a running from the nose or ear or a pain anywhere? Does he want to rest and lie down unlike his usual self? If he shows none of these symptoms, reflect that he may have had some food since his last meal without your knowing of it. Fruit and lollies, cakes and ice-cream, all these are possibilities. If you are satisfied that this is not so, reflect that you may have been over-feeding the boy. His want of appetite may be just Nature's attempt to save him from sickness. In any such case leave him alone. By next meal time the boy may be different.

Negativism.

Sometimes we have to deal with a much more serious situation. The mother is worried because Tommy is always refusing his meals. It has become a habit and she thinks he is getting thinner. How can we explain this? There is something wrong in the relation of Tommy to his mother. In nearly every instance we find this wrong thing first in the mother and not in Tommy himself. There are some women who take as naturally to the habit of scolding as ducks take to water. The natural reaction to scolding is to take as little notice of it as possible, to treat it like a thunderstorm, which may be unpleasant for a time, but will not last for ever. If this is not sufficient, the child develops a passive resistance, a mute obstinancy, a state of mind which scientific men call negativism. He can be forced to do some things, but he has discovered that he can't be forced to eat, and he won't.

Parental Errors.

This is not the most common cause. More often the mother's anxiety has led her to try coaxing and persuading. She has tried to tempt Tommy to eat by giving him whatever she thinks he will like, and then adding promises and bribes, which have failed to succeed. Tommy finds himself the centre of attention at every mealtime. He realises, perhaps unconsciously, that by refusing to eat he lives in the limelight, and he relishes this, until it becomes a morbid habit. Perhaps when no one is looking he will eat anything that comes handy, but this is not always so. He may really lose condition and the situation may become serious. The only thing the mother can do then is to alter her tactics. If he refuses a meal that is not really distasteful, smile and say "very well dear" and put it away until next mealtime arrives; giving him no food between meals. Probably by next mealtime he is really hungry, and if no notice is taken, will eat what is set before him. Few children will refuse more than two meals. If he is one of these few, his mother must put him in someone else's charge. We have known such cases in which a short stay in a private hospital has wrought a speedy and complete cure. The cure will last, unless the mother resumes her former unwise management.

If Tommy's refusal applies not to all [illegible] [illegible]ticles of diet only, two explanations may be suggested. Pos[illegible] [illegible]ly child, he has been influenced by the fancies freely expre[illegible] [illegible] him in older people, or a well-meant effort has been ma[illegible] [illegible] methods already described, to eat foods which were consid[illegible] [illegible] him, for instance, milk foods or green vegetables.

If the mother understood Tommy better and unde[illegible] difficulties would not occur.

SUNFLOWER SEED PRODUCTION.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) state[illegible] of an interview recently with the members of the Canary Seed Boar[illegible] discussed the possibilities of producing sunflower seed for commercial p[illegible]

The immediate Australian demand for the seed of the sunflower ([illegible] *annuus*) does not exceed several hundred tons yearly, but there are prospects [illegible] market within the Commonwealth for this seed might be further developed. [illegible] variety of sunflower seed known here as Manchurian or Mammoth Russian is most suited for Australian requirements, and the planting of other varieties is not recommended.

Seed of the Manchurian variety is obtainable from the secretary of the Canary Seed Board, Box 185C, Brisbane. It is understood that the price of the seed is sixpence per pound.

The sunflower grows satisfactorily on similar soil types, and under the conditions of climate and methods of cultivation as are suitable for the production of maize. The sunflower is usually grown for seed but, in both the United States of America and Canada, the plant is used for silage purposes with comparatively satisfactory results, but it is not regarded quite the equal of corn in ensilage making.

When grown for seed production the planting should be in drills 36 in. apart, and the distance between the seeds in the drills should not be less than 15 in. From 7 to 8 lb. of seed is required to sow an acre of land. The seed may be sown satisfactorily with an ordinary grain drill, some of the seed tubes being plugged to suit the case. The sunflower is a summer crop, and may be planted during October.

In several of the countries where the growing of sunflowers is engaged upon the yield under average conditions ranges from 1,000 to 1,200 lb. per acre, while returns up to 1,700 lb. per acre have been recorded.

The market value of seed of good quality in Australia is seldom less than £18 per ton, and higher price levels are not unusual. To farmers with suitable land available for the growing of the sunflower a trial plot up to 3 acres in extent might be considered worth while.

In the meantime investigations are being made as to the prospects of sales of sunflower seed on the oversea markets, but these and other matters will be more fully enquired into in the event of the initial effort in production being sufficiently encouraging.

Orchard Notes for December.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Farm Notes for De[illegible]

ALTHOUGH November is regarded generally as the best [illegible] main maize crop, on account of the tasseling period harmo[illegible] the summer rains, December planting may be carried out in districts [illegible] are not prevalent, provided a known quick maturing variety of mai[illegible]

To ensure a supply of late autumn and winter feed, dairymen are [illegible] make successive sowings of maize and sorghums, to be ultimately used either [illegible] feed or in the form of ensilage. The necessity for such provision cannot be [illegible] strongly urged. Farmers who have not had any experience in building an ensila[illegible] stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1932.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Extremes. Max. Date.	Extremes. Min.	Extremes. Min. Date.	Rainfall. Total.	Rainfall. Wet Days.
	In.	Deg.	Deg.	Deg.	Date.	Deg.	Date.	Points.	
Coastal.									
Cooktown	30·01	82	68	87	20, 25	59	13	27	2
Herberton	..	77	51	88	24	41	18	12	3
Rockhampton	30·04	83	59	92	22	51	11	63	6
Brisbane	30·08	74	54	82	13	47	10	300	12
Darling Downs.									
Dalby	30·06	75	46	83	14	35	1	156	7
Stanthorpe	..	66	39	75	14	25	10	228	10
Toowoomba	..	68	45	75	13, 14, 5	34	10	301	12
Mid-interior.									
Georgetown	29·96	89	57	96	24	43	17	Nil	..
Longreach	30·01	84	53	91	20, 28	43	1	8	2
Mitchell	30·05	75	43	86	14	32	7	53	4
Western.									
Burketown	29·99	89	63	97	23, 26	54	16	Nil	..
Boulia	30·02	83	52	97	20	40	15	6	1
Thargomindah	30·04	77	51	88	14	40	1	3	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Sep.	Average Rainfall. No. of Years' Records.	Total Rainfall. Sep., 1932.	Total Rainfall. Sep., 1931.
North Coast.	In.		In.	In.
Atherton	0·65	31	0·10	0·31
Cairns	1·67	50	0·52	0·72
Cardwell	1·52	60	0·07	0·65
Cooktown	0·58	56	0·27	0·31
Herberton	0·52	46	0·12	0·26
Ingham	1·49	40	0·39	1·18
Innisfail	3·52	51	0·56	2·02
Mossman Mill ..	1·43	19	0·45	1·22
Townsville	0·82	61	0	0·32
Central Coast.				
Ayr	1·42	45	0	0·27
Bowen	0·82	61	0·19	0·28
Charters Towers ..	0·82	50	0	4·13
Mackay	1·58	61	0·71	0·97
Proserpine	2·10	29	0·90	0·08
St. Lawrence ..	1·31	61	0·47	5·05
South Coast.				
Biggenden	1·53	33	0·99	1·35
Bundaberg	1·63	49	0·98	0·83
Brisbane	2·00	81	3·00	0·91
Caboolture	1·84	45	3·10	1·49
Childers	1·82	37	2·08	2·15
Crohamhurst ..	2·57	39	4·02	1·81
Esk	2·13	45	2·27	1·10
Gayndah	1·56	61	1·00	1·16
Gympie	2·09	62	4·00	1·10
Kilkivan	1·69	53	1·65	1·57
Maryborough ..	1·90	60	2 95	0·75

Divisions and Stations.	Average Rainfall. Sep.	Average Rainfall. No. of Years' Records.	Total Rainfall. Sep., 1932.	Total Rainfall. Sep., 1931.
South Coast—continued—	In.		In.	In.
Nambour	2·51	36	3·00	2·03
Nanango	1·81	50	1·64	2·67
Rockhampton ..	1·34	45	0 63	2·75
Woodford	2·18	45	2·32	1·81
Darling Downs				
Dalby	1·68	62	1·56	1·47
Emu Vale	1·72	36	3·13	1·10
Jimbour	1·49	44	1·20	1·60
Miles	1·34	47	1·09	0·53
Stanthorpe ..	2·28	59	2·28	2·34
Toowoomba ..	2·13	60	3·01	1·37
Warwick	1·80	67	3·18	1·79
Maranoa.				
Roma	1·42	58	0·65	0·32
State Farms, &c.				
Bungeworgorai ..	0·93	18	0·73	0·18
Gatton College ..	1·52	33	3·11	0·83
Gindie	1·04	33	0·10	1·17
Hermitage ..	1·47	26	2·89	1·32
Kairi	0·63	18	..	0·25
Mackay Sugar Experiment Station	1·47	35	0·76	0·52

GEORGE E. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA F[illegible]

TIMES COMPUTED BY D. EGLINTON, F.R.A.[illegible]

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1932.		December, 1932.		MOONRISE. Nov., 1932.	MOONRISE. Dec., 1932.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·6	6·6	4·51	6·31	6·43	7·39
2	5·5	6·7	4·51	6·31	7·45	8·44
3	5·4	6·8	4·51	6·32	8·52	9·49
4	5·3	6·8	4·52	6·33	9·55	10·51
5	5·2	6·9	4·52	6·33	11·0	11·47
					p.m.	p.m.
6	5·2	6·10	4·52	6·34	12·2	12·41
7	5·1	6·11	4·53	6·34	12·59	1·35
8	5·0	6·12	4·53	6·35	1·55	2·27
9	5·0	6·13	4·53	6·35	2·47	3·23
10	4·59	6·13	4·53	6·36	3·40	4·17
11	4·59	6·14	4·54	6·37	4·33	5·12
12	4·58	6·15	4·54	6·37	5·27	6·7
13	4·58	6·16	4·54	6·38	6·23	7·0
14	4·57	6·16	4·54	6·38	7·17	7·53
15	4·57	6·17	4·54	6·39	8·12	8·41
16	4·56	6·18	4·55	6·39	9·4	9·25
17	4·56	6·19	4·55	6·40	9·55	10·3
18	4·56	6·20	4·56	6·41	10·42	10·35
19	4·55	6·21	4·56	6·41	11·28	11·7
20	4·55	6·22	4·57	6·42	12·[illegible]	11·39
21	4·55	6·23	4·57	6·43	..	..
					a.m.	a.m.
22	4·54	6·23	4·58	6·43	12·35	12·10
23	4·54	6·24	4·58	6·44	1·6	12·45
24	4·53	6·25	4·59	6·44	1·38	1·21
25	4·53	6·25	4·59	6·45	2·13	2·7
26	4·53	6·26	5·0	6·45	2·48	3·3
27	4·53	6·27	5·0	6·46	3·30	4·7
28	4·52	6·27	5·1	6·46	4·24	5·14
29	4·52	6·28	5·1	6·46	5·23	6·22
30	4·52	6·29	5·2	6·47	6·30	7·30
31	..	..	5·3	6·47	..	8·36

Phases of the [illegible]

5 Nov.	☾ First Q[illegible]	
13 ,,	○ Full Moon	[illegible]
21 ,,	☽ Last Quarter	[illegible]
28 ,,	● New Moon	[illegible]

Apogee, 13th November at 8·6 p.m.
Perigee, 28th November at 12·36 a.m.

As Mercury will be at its greatest elongation, [illegible] degrees east of the Sun on the 14th, it will remain above the western horizon for more than an hour and a-half after sunset, for several days before and after that date, and should attract general attention.

On the 22nd, at 4 a.m., the Moon will be passing Mars, which will be only twice the diameter of the Moon to the northward.

The Sun having crossed the equator southward on 23rd September, will reach Cape York on 21st October, and again on 21st February, when returning northward. The clock time on 21st October will be 12·13 p.m., and on 21st February, 12·42 p.m. In November the Sun will be directly overhead at midday only as far south as a little below Mackay, Hughenden, and Cloncurry. It will be over Cairns 8th November, over Townsville 18th November, Charters Towers 22nd November, Hughenden 27th November, and over Winton on 6th December.

The Moon's path amongst the stars in November will be in Orphiuscus on the 1st, in Sagittarius on the 2nd and 3rd, Capricornus 4th and 5th, Aquarius 6th and 7th, Pisces from the 8th to 11th, in Aries on the 12th, in Taurus from the 13th to 16th, in Gemini 17th and 18th, in Cancer 19th, in Leo from the 20th to 22nd, in Virgo from 23rd to 25th, Libra 26th and 27th, Orphiuscus 28th, and in Sagittarius on the 29th and 30th.

Mercury sets at 7.36 p.m. on 1st November and at 8·5 p.m. on the 15th.

Venus rises at 3.13 a.m. on 1st November and at 3·6 a.m. on the 15th.

Mars rises at 1.32 a.m. on 1st November and at 12·59 a.m. on the 15th.

Jupiter rises at 2·38 a.m. on the 1st and at 1·50 a.m. on the 15th.

Saturn rises at 10.36 a.m. and sets at midnight on 1st November, on the 15th it rises at 9.41 a.m. and sets at 11·9 p.m.

The Southern Cross will reach position XII. at 10 a.m. on 1st November, III. at 4 p.m., and will disappear in the south-west early in the evening; it will therefore be very little seen during this month.

5 Dec.	☾ First Quarter	7 45 a.m.
13 ,,	○ Full Moon	12 21 p.m.
21 ,,	☽ Last Quarter	6 22 a.m.
27 ,,	● New Moon	9 22 p.m.

Apogee, 10th December, at 10.12 p.m.
Perigee, 26th December, at 11.36 a.m.

Mercury when passing from east to west of the Sun on the 4th will miss a transit of the Sun's face by being more than a diameter of the Moon northward of it. On the 23rd Mercury will reach its greatest western elongation, 22 degrees.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXVIII. 1 DECEMBER, 1932. PART 6.

Event and Comment.

St. Lucia Farm School.

AT a conference in the course of the month of representatives of Government departments and interested citizen organisations, convened by the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, and at which he presided, a scheme for training boys for land pursuits was approved unanimously. In outlining the scheme, Mr. Bulcock said that he considered it would be fatal to the scheme if the Government were to embark on it unless it had the definite assurance that the lads would be placed in work on the land once they had passed through the training farm. Therefore, he had enlisted the aid of outside public bodies and of the officers of other Government departments, seeking their advice and co-operation. They had one common objective—the provision of some form of training that would fit for life on the land boys for whom at present there were no city industrial vocations, and to so stem the flow of population as to, in some measure, adjust the balance between the bush and the city. In the tentative curriculum provision was made for both animal husbandry and general agriculture—a good general rudimentary training. The object also was to raise at St. Lucia as much as possible of the foodstuffs required there. It would be a testing ground for the boys, and the right would be reserved to eliminate those who obviously did not possess an agricultural sense and were not fitted for the work.

The Public Service Commissioner, Mr. J. D. Story, I.S.O., submitted comprehensive proposals under which the period of training in the farm school would be, approximately, six months for each group of selected boys, the places to be made available in the first place for fifty suitable boys. Expensive buildings and equipment would be taboo, and as far as possible marketable commodities would be produced. The layout would be on a systematic plan. The main essentials of the scheme are:—The selection of lads suitable for farm work and eager to learn farm routine; the provision of a course of training which, besides being attractive, would enable the boys on the completion of the course to take an intelligent and efficient part in general farm work; and the absorption of the boys by the farming industries

on the completion of their training. Failure in any one of these directions, said Mr. Story, would undoubtedly wreck the scheme and result in wasted effort and expenditure. All should wholeheartedly co-operate and work for co-ordinated action. So that a definite scheme embracing these essentials might be evolved, he suggested the creation of a provisional general committee out of which should be appointed:—(1) A recruiting committee; (2) a farm programme committee; (3) an employment committee. He emphasised that there must be a continuous supply of boys, not merely at the start, but every six months thereafter, and that to ensure that there must be an organisation to recruit them, and also to fill the places of any that might fall out.

The proposals were discussed very fully and the outcome of the conference was the appointment of a general advisory committee with power to add to its number. From this committee the suggested sub-committees were formed. These sub-committees met subsequently and each has since reported to the general advisory committee, by which every report was adopted after serious consideration.

The recruiting committee recommended that the age of trainees should be between fifteen and twenty years, and that physical fitness should be determined by personal interview, and, if necessary, by medical examination. The educational standard was fixed at fifth grade in primary schools. It was decided to send to representative organisations a circular directing the attention of unemployed boys to classes at the Central Technical College with a view to their ultimately entering the St. Lucia Farm School on the University land at St. Lucia.

The programme committee's report concerned the layout of the ground, accommodation, equipment, and other details. It was recommended that the boys should be instructed in mixed farming, dairying, and poultry and pig-raising at St. Lucia, and in general timber work at Moggill on land which also belongs to the Queensland University.

The report of the employment committee dealt with the placing of boys after they have completed their period of training, and its recommendations followed closely along the lines employed by the New Settlers' League and the Immigration Department. It was decided to ask prospective employers to get in touch with the central committee and the employment committee.

Final preparations are now in hand and the school will open on 30th January. Already forty-eight applications have been received from boys desiring to take advantage of the course of training offered and no difficulty in getting the required number for each term is anticipated. An executive, consisting of the Minister and the conveners of the several sub-committees, will confer on additional details. No fees will be charged and tram and ferry fares will be provided for day students.

The wisdom of the Minister in initiating the scheme has been commended widely in the public press and by citizens generally. The best brains, the most thoughtful men and women of the community are searching for some means of giving boys leaving school a definite place among the nation's workers. It is generally felt that a practical effort must be made to readjust our lopsided distribution of population, and Mr. Bulcock's scheme, which, though necessarily limited in scope in its initiatory stages, is capable of vast extension, is regarded as a movement in the right direction. The transference of town boys to the country, where they will gain practical experience and an agricultural bias, is regarded as a preliminary to their becoming either share farmers or producers on their own holdings. Every intelligent citizen must realise that it will be many a long day before city industries can absorb any more than a small proportion of the boys turned out annually from our schools, so the land offers, obviously, the only way out. The direction of the minds of our youths to rural occupations cannot, however, be regarded merely as a temporary expedient, but as a first step in a movement back to the land in which is bound up inextricably our future as a nation.

Our Economic Problems.

"THERE is in the world to-day great depression and very serious unemployment. We all realise that this is due to no mere cyclical depression to be cured by one or two harvests. We have to look further for cause and cure." In those words His Excellency the Governor, Sir Leslie Orme Wilson, speaking on the general economic situation at a gathering of city men in the course of the month, expressed what is in the minds of all thoughtful citizens. On the suggestion that there can be but one remedy for a greatly diminished national income—namely, reduced expenditure—a reduction to be shared by all sections of the community—he hesitated to agree that that was the only remedy, and felt inclined to think that such a course must greatly aggravate the present unemployment situation in the world.

His Excellency proceeded to quote from a speech by the Prince of Wales when addressing the International Congress of Commercial Education. The Prince declared that the world-wide trade depression and economic disturbance had been largely caused by maladjustment of distribution, and concluded by saying: "Our urgent task is to bring consumption and production into a proper relationship—not a simple but quite a possible task."

He added: "I believe there is a way other than creating more unemployment by rigid economy, by means of which the producer of raw materials and primary products, the workman and the agriculturist will be able to obtain a reasonable reward for his work and enterprise, and so enable him to buy again the manufactured goods of the work bench and shop."

The Dairy Industry—A Five-Year Plan.

SPEAKING at a recent gathering of West Moreton farmers, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, said that the sugar industry had made wonderful progress, due to the application of scientific principles to the industry, and the same applied to sheep and wool. With the dairying industry they might reasonably ask themselves if everything that could be done had been done. There were three things they had to consider—first, the testing of herds from the production point of view; second, the survey of herds from the health point of view; and the third, the marketing of the products resulting from the correct application of the first two principles. The department considered herd-testing of paramount importance. In Denmark thirty years ago the average production per cow was exactly the same as we had in Queensland to-day. Thirty years gave them a long-range view of the question, and in that time in Denmark they had increased their production 100 per cent., from 147.9 lb. butter-fat per cow to just over the 300 mark, and yet the climatic conditions of Denmark were no better than Queensland. They had been conducting herd-testing in this State in a very limited way. Leaders in the dairying industry all said that one of the greatest difficulties that was being encountered was the poor type of bull that was being used.

The dairy farmers were looking for a lead, and he proposed to set up a board to administer a scheme to deal with various phases of the industry. He believed he could get a long way further with the farmers if he entrusted this work to farmers' representatives. He proposed, therefore, a board of three people—two representatives of the industry, and the Chief Dairy Expert of the State, Mr. McGrath. He had in his mind a tentative scheme for five years, and estimated the cost to the department at £10,000 a year.

The time had come when the dairying industry was of sufficient magnitude to have its own health service, and he proposed to appoint two veterinarians specially for the work. He did not want to tell farmers that they had to abandon the unproductive cow, but he proposed, where the farmer concurred, that the veterinary surgeon should spey the cow. The scheme meant the registration of every bull in the State, at a registration fee of 5s. per bull. The second year would probably mean elimination of certain bulls, and the replacement of these bulls from the fund. The first year would be an organising year, and the third year would find them with a sound progressive scheme, and he did not believe it would ever be abandoned. If they gave him their full co-operation he was sure he could bring the scheme into effect. If only one arm of the service succeeded, they would be repaid a hundredfold.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

THE GREY-BACK BEETLE.

By EDMUND JARVIS.

It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.—EDITOR.

DURING December grey-back cane beetles can generally be found on their various feeding trees, such as the Figs and the so-called "Moreton Bay Ash," besides other favourite food plants.

In years when this cane pest chances to emerge in November its first-stage grubs can be found amongst the fibrous feeding roots of cane in late December.

HABITS OF THE GREY-BACK COCKCHAFER.

A few hours after a fall of from 3 to 5 inches of rain (which usually occurs towards the end of November or middle of December) the awaiting host of grey-backs, acting under the stimulus of such moisture, start to tunnel upwards through the ground until reaching the top 2 inches of surface soil, where they remain until daylight has given place to semi-darkness.

Emergence takes place about 7.15 p.m., at which time a wave of unrest apparently induces activity in every beetle simultaneously, causing the swarming multitude to crawl excitedly out of the ground on to the surface to extend their now quivering antennæ, spread their elytra and large membranous wings, and finally to mount into the air to enter upon their winged or perfect state.

Thenceforth 'mong fragrant gums to freely roam,
And taste the glories of their native home.

Having exercised their wings for an hour or two, the main body settle amongst twigs and branches of the nearest trees, where copulation takes place the same evening at a height of 15 to 20 feet from the ground, after which they usually fly about again for a time until finding suitable food plants. During the succeeding ten to fourteen days, while the ovaries are developing, these beetles live a free arboreal life, many hours of daylight, however (from dawn to noon), being passed in a state of torpidity or slumber.

If disturbed at such times they drop hastily to the ground, offering little or no signs of life, and refusing to crawl or fly away when handled.

While clinging to the leaves in this passive sleeply condition many specimens are attacked by parasitic insect enemies in the shape of Tachinid flies, three species of which manage to affix eggs to their bodies or deposit tiny maggots on them, which quickly wriggling out of sight bore into the living tissues.

Being settled on the trees, fully exposed to all weathers, these beetles are naturally more or less affected by abnormal degrees of temperature. For example, on days when the maximum shade heat reaches 95 to 100 degrees Fahr., and the wind happens to be north-west, they soon exhibit signs of restlessness, and at length, becoming fully awakened, begin to crawl quickly about in search of cooler positions.

On such days the grey-backs in a large feeding tree will, as a last resource, often fly in a body to the shaded or sheltered side of the trunk and settle there side by side in mass formation.

PLATE 168.
Habits of the "Greyback" Cockchafer Beetle during the month of December.

Duration of the usual evening flight is greatly influenced also by temperature, humidity, and illumination.

On warm dark nights following showery days these cockchafers become exceedingly active, often remaining on the wing several hours and being freely attracted to artificial lights. When no rain has fallen for a week, however, and the surface soil becomes very dry, they will often refuse to fly at all at the usual time (7.15 p.m.), or else take to wing for a few minutes only. Again, on moonlight nights, grey-backs are little in evidence, although should the atmosphere chance to be moist, and the sky more or less cloudy, migration may occasionally take place.

On such evenings I have watched the passage overhead of an extensive army of these beetles travelling westward, the members of which maintained a distance of 15 to 20 feet from the ground and 2 to 4 feet from each other.

The period of oviposition commences about a fortnight after emergence of beetles from the soil. Plantations are then invaded at night time by egg-laden females derived from food plants near at hand, which upon alighting on the ground against the base of a cane stool tunnel underneath it to the depth of a foot or more, and deposit their eggs in a roughly-formed ovate cavity or chamber measuring about 1¾ inch by 1 inch.

Each beetle is able to lay thirty-six eggs of a creamy-yellow colour, which just before hatching swell to nearly ¼ inch in diameter. About ten days after oviposition the tiny newly-hatched grubs make their appearance, and tunnelling upwards ultimately reach and take up their quarters amongst the fibrous feeding roots around the underground basal portions of the cane sticks.

These grubs of the first stage of growth can always be recognised at a glance by the width of head, which is ⅛ inch (never more or never less), remaining so throughout the period of the first instar, although, of course, the length of the entire grub may vary from ¼ to ⅝ inch, according to the number of days which may have elapsed since its first appearance.

METHODS OF CONTROLLING THE BEETLE AND EGG STAGES.

Collecting Cane Beetles.

The practice of this common-sense remedial measure is more or less followed by growers in Australia, and has been found, on the whole, to yield beneficial results.

Such appears to have been the case also in other parts of the world wherever the grubs of lamellicorn beetles figure as being important economic problems. Growers in the Cairns district used at one time to collect their grubs and beetles, and this work could, I think, still be followed up with advantage by individual cane farmers.

Full instructions, however, regarding this interesting question have been published by the Sugar Bureau from time to time in the "Queensland Agricultural Journal" and "The Australian Sugar Journal," a few references to which may, perhaps, be found useful to some of our growers:—"Queensland Agricultural Journal," Vol. XXXII., p. 575, and XXXIV., p. 486; "The Australian Sugar Journal," Vol. XXIII., p. 415, and XXII., p. 459.

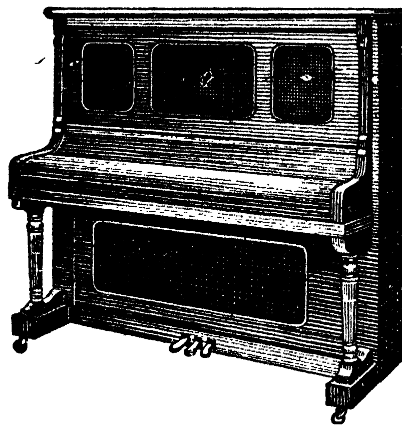
NATURAL CONTROL BROUGHT ABOUT BY DROUGHT AND EXCESSIVE HEAT.

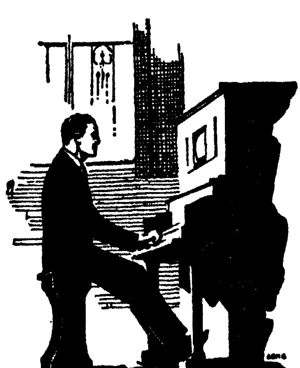
Control of this nature, resulting from the occurrence of adverse meteorological conditions at a time when these beetles are waiting to emerge from the ground, are doubtless of immense benefit to all concerned.

A check of this kind may at times destroy from 50 to 75 per cent. of all the grey-backs inhabiting an area embracing several hundred square miles of country.

During the year 1915, for instance, a dry spell lasting from July to November kept these cockchafers imprisoned in their pupal cells for nearly two months, causing hundreds of thousands which had transformed to the pupal state in September to perish helplessly.

Quantities of these dead beetles were ploughed up towards the end of November, and could be seen lying dead in the furrows.





The following additional methods of fighting the adult form of this cane pest should be mentioned here:—

1. Destruction of their feeding trees.
2. Capturing the beetles by means of light traps.
3. The use of soil deterrents against laying of the eggs.
4. Poisoning the leaves of their food plants.
5. More rigorous protection of our insectivorous birds.

Nos. 3, 4, and 5 are well worthy of closer study in the future, and considered from an economic standpoint present decided possibilities.

FACTS WHICH GROWERS SHOULD MEMORISE.

This being a beetle and egg month, an account of the grub condition of our grey-back will not be dealt with here, this being reserved for the period of January to March, when the activities manifested during such phase of its life-history will doubtless claim their usual share of attention from cane farmers. With regard to the winged form of this cockchafer, however, a note should be made of the dates on which grey-backs derived from the primary brood or from any succeeding emergences were first noticed on the wing in decided numbers. This point is very important, seeing that it is possible to determine from such dates later on the correct time for commencing fumigation work against the grubs with every likelihood of success.

A period of about seventy days should be allowed to elapse from laying of the eggs before starting fumigation of grub-infested soil. In seasons when there chances to be a secondary emergence of cane beetles, the above period would need to be extended to about 100 days in order to destroy the grubs from both emergences.

For fuller information on this point readers should refer to the "Queensland Agricultural Journal," Vol. XXXVIII., pp. 6 to 7, July, 1932.

The plate for this month shows grey-back beetles engaged in feeding on leaves, emerging from a pupal chamber (the track of its passage from same descending as indicated to a level below two egg chambers), and in the act of ovipositing. The eggs in one of these chambers are nearly ready to hatch, the female having—as indicated by tunnel—made its way again to the surface and flown off to feeding trees. Grubs of the first stage are shown just hatched from eggs, and others feeding on fibrous cane-roots near the surface.

THE RIGHT SPIRIT.

The story of a young teacher's success in educating the children of a "decadent" country district was told by the Tasmanian Director of Education (Mr. G. V. Brooks) at a Sydney Rotary Club luncheon. About five years ago, Mr. Brooks said, a young teacher was appointed to a school of fifty-seven pupils at the township of Springfield, Tasmania. The new teacher called a meeting of parents to discuss plans for cultivating four acres of swampy scrub land attached to the school. Not a single parent attended the meeting. The teacher appealed to the children to co-operate, and they and the teacher set about clearing and cultivating their plot of land. They obtained the money to begin work by selling £2 10s. worth of firewood to the Education Department. To-day there was £15 in the joint banking account of the teacher and the children, few of whom had ever had any money before. They had cleared and fenced the land, planted permanent pasture, and carried out many valuable experiments. Above all, they had learned the use of money and had gained qualities of citizenship. After some time the teacher advised the children to clear bracken-infested land on their parents' farms and plant potatoes. He offered to supply gratis the seed potatoes required, and was nonplussed when he discovered that so much land had been cleared by the children that £50 worth of seed would be needed. The Launceston Rotary Club offered to give the seed to the children, but, at a meeting of the pupils, a boy of twelve rose to his feet and moved that the offer be declined, and that the £50 be borrowed from the agricultural bank. An offer of free fertilizer by the Electrolytic Zinc Company was also declined by the pupils, who asked to be sold the fertilizer on twelve months' credit. On an average, the children gathered 9 tons to the acre, compared with the State average of 3 tons to the acre. During the depression not a child has gone from that school who has not gone to a job.

BANDED (SECTIONAL) CHLOROSIS.

ASSOCIATED WITH TANGLE TOP AND DEATH OF SUGAR-CANE.

By ARTHUR F. BELL, Pathologist.

DURING discussion in the session devoted to sugar-cane diseases at the initial conference of the International Society of Sugar-cane Technologists (Honolulu, August, 1924), reference was made to the occurrence of broad white bands upon the leaves of sugar-cane[2]. This form of chlorosis, which was termed sectional chlorosis, was reported by delegates as being present in Australia, Hawaii, and Continental United States. Mr. D. S. North stated that it was very common in New South Wales, and was there considered to be due to the combined influences of

PLATE 169 (FIG. 1).
Typical white bands on leaves of the variety M. 1900 Sdg.

cold weather and the collection of water in the central cylinder of leaves. Dr. E. W. Brandes stated that the trouble had occurred in the greenhouses at Washington, D.C., which, he claimed, indicated that cold weather was not a necessary factor.

Description and Causation of White Bands.

The white bands (see Figs. 1 and 2) are typically 2 to 4 inches wide, irregular in horizontal outline, and range from marginal strips to bands which stretch across the whole leaf, the latter type being the more common. In rare cases only is the band uniformly white in colour, the midrib and larger veins remaining green as a rule. The injury to the tissue is permanent, and in no case does it regain the power of forming chlorophyll. The number of bands upon a single leaf varies from one to several (Fig. 2). The bands are progressively higher on the younger leaves, indicating that the injury took place in the leaf cornucopia and

PLATE 170 (FIG. 2).—Multiple bands on leaves of the variety D. 1135.

originally at the same level, but the greater growth rate of the young leaves carries the bands correspondingly higher. Upon dissecting the spindle of a recently injured shoot, it is found that the bands persist right through to the youngest leaves in the spindle.

The type of band is to some extent dependent upon the variety of cane. Those upon M. 1900 Seedling (Fig. 1) are uniformly broad and extend from margin to margin, while those upon leaves of D. 1135 (Fig. 2) are frequently very narrow. According to Faris[3], the colourless areas of certain varieties in Cuba are later attacked by fungi which cause the formation of reddish stripes with grey centres; the leaf tissue may split along these lines of weakness. As will be emphasised later, the feature is very pronounced in certain varieties in Australia.

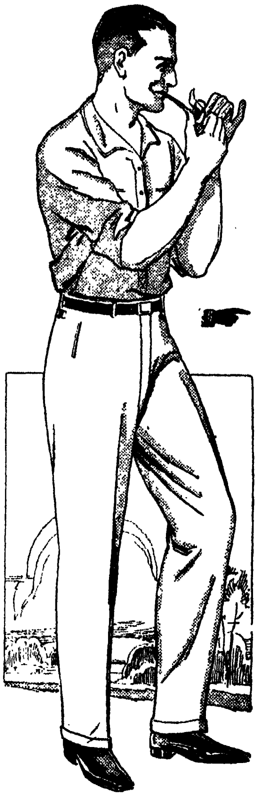
Such colourless bands were artificially produced by Faris[3] in 1926. Inverted cones of strong paper were tied around the upper leaves of a number of canes and the cones kept filled with cracked ice on three consecutive nights; the typical bands appeared upon the leaves of the treated plants about one week later. The experiment was successfully repeated by Newcombe and Lee[5] in Hawaii in 1927.

Nomenclature.

Faris, in view of his experimental methods, applied the term "Cold Chlorosis" to this type of injury, but the term was not generally accepted owing to its occurrence in the greenhouses at Washington. Newcombe and Lee reverted to the original name of Sectional Chlorosis. In conversation with Mr. J. P. Martin, Pathologist to the H.S.P.A. Experiment Station, during his visit to this country in 1929, it was agreed that the term "Banded Chlorosis" would be more descriptive. Chloroses due to deficiencies of nitrogen, iron, and manganese, and sectional chimeras, are all "sectional," but no other form of banded chlorosis is known. Confusion with banded sclerotial disease is unlikely, as in this case the bands are multi-coloured and the disease is not widespread in the areas in which banded chlorosis is found. Moreover, banded sclerotial disease, in Australia at least, is found only during the uniformly warm, rainy season.

The Disease in Australia.

Banded chlorosis is extremely common throughout the winter months in New South Wales and Central and Southern Queensland, particularly in localities where the varieties M. 1900 Seedling and D. 1135 are grown extensively. The occurrence of several bands upon each leaf (Fig. 2) is quite frequent, and in the case of susceptible varieties a reduction of more than 50 per cent. in the green tissue of the leaf is common. Individual bands have been found to vary in width from one-fourth of an inch to seven inches. In the northern section of the Queensland sugar belt (latitude 17 S.) banded chlorosis is seen rather infrequently on Badila, which constitutes over 90 per cent. of the crop, but is common on the variety D. 1135, which is grown on the poorer soils. In Central and Southern Queensland it has been observed on every variety grown commercially, but in the case of Uba occurred only on the leaves of young suckers. The leaves of side shoots are affected as readily as are those of the main stem. Among the commercially-grown varieties which are severely affected are M. 189, Q. 813, B. 208, D. 1135, and M. 1900 Seedling, the latter being damaged to the greatest extent.



While this form of chlorosis is normally confined to the cooler months of the year, it is occasionally observed during the summer months. In December, 1926, towards the end of a six-months drought, Messrs. North and Dormer observed a field on the Richmond River in which the chlorosis was so bad that practically the whole of the effective leaf surface was destroyed. The cane was fifteen-months-old ratoons of an unknown variety; adjoining fields of Badila were also injured, but to a much less extent. The minimum temperatures recorded in this vicinity were:—November, lowest minimum 49 deg. F., highest minimum 66 deg. F., mean minimum 57 deg. F.; December, 51 deg. F., 78 deg. F., and 62·5 deg. F. No unduly high temperatures were registered during this period. In each case the fall to the minimum was relatively sudden;

PLATE 171 (FIG. 3).

Leaves of M. 1900 S. showing purple and black discoloration of bands and destruction of leaf tissues.

and the occurrence of the bands appears to depend on a relatively large sudden drop in temperature rather than on the absolute temperature.

Banded chlorosis may also be observed on a number of grasses, particularly on nut grass, *Cyperus rotundus*.

PLATE 172 (FIG. 4).

Collapsing leaves and incipient tangle-top due to the spindle of immature leaves having become caught in the shredded portion of one of the collapsing leaves of variety M. 1900 S.

With non-susceptible varieties of cane, the inhibition of the development of chlorophyll, with the resultant formation of white bands upon the leaves, marks the limit of the injury, but in the case of susceptible varieties the injury may be such as ultimately to kill the cane. The stages in the further progress of the disease in susceptible varieties are as follows:—In the course of a week or two the white bands become purple in colour; the change to purple commences at the base and may or may not extend over the whole band. At this stage the injured areas may be invaded by fungi, which rot the leaf tissue, causing the colour of the band to change from purple to black and then to ashy grey. In some varieties, however, the rotting of the tissues is not preceded by the purple discoloration. Finally the leaf becomes split and shredded (see Fig. 3). As a rule, the rotting of the tissue commences midway between midrib and margin, and proceeds rapidly. Throughout all the colour changes the bands retain a streaked appearance owing to the fact that the large veins tend to retain their normal colour. On one leaf there may frequently be seen five bands showing the five stages outlined above—viz., white, purple, black, ash-coloured, and shredded.

PLATE 173 (FIG. 5).

Final stages of the disease. The growing point is dead and the leaf spindle twisted and rope-like. This has been followed by a profuse production of side shoots, two of which have in turn entered upon the tangle-top stage.

The death and shredding of the tissue cause the leaves to lose their rigidity and hang limply downwards from this point (Fig. 4). It frequently happens that a leaf, collapsing in this manner, becomes entangled about the spindle of immature leaves and prevents their free upward growth. The spindle becomes bent and twisted as the young leaves endeavour to break free, with the result that finally there occur many cases of tangle top as described by Lee[4] and Priode[6]. A case of incipient tangle top produced in this manner is shown in Fig. 4. In extreme cases the spindle of leaves becomes so matted and tangled that further upward growth is prevented, and the cane top dies (Fig. 5).

PLATE 174 (FIG. 6).
Section of a dead top of 1900 S. showing the extraordinary twisting of the leaf spindle.

The death of the cane top is followed by a profuse production of side shoots, many of which also develop tangle top. A section of a dead cane top illustrating the tortuous twisting and malformation of the young leaves in the spindle is shown in Fig. 6. This stage is very similar to the "curly top" of Malabar seen on the Richmond River, New South Wales.

The winter of 1928 was comparatively severe, and cases of tangle top produced in this manner were very common throughout the central and southern portions of the State. The number of cases which were followed by the death of the cane were sporadic, with the exception of one field of mature plant 1900 Seedling in the Bundaberg district. The damage was particularly noticeable in the northern half of the field; here 25 per cent. of the canes had progressed to the tangle top stage, and of these approximately 30 per cent. were killed. Gumming disease was known to exist in this field, but in no case was there any evidence that this disease was directly responsible for the death of the cane. No gum oozed from any of the sticks in sweating, and in only one or two instances was there even a discoloration of the vascular bundles. There was a complete absence of the ladder-like lesions of pokkah boeng, as described by Bolle[1], or any other symptom of fungous attack. On the other hand, it is quite possible that the presence of gumming disease was a factor in bringing about the high mortality in this case.

As stated above, the effective leaf surface may frequently be reduced by more than 50 per cent., but as this reduction takes place mainly during the dry, cold months of the year, when growth is practically at a standstill, it is not considered that an appreciable loss in tonnage is experienced.

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FIG. 1.—Typical white bands on leaves of the variety M.1900 Seedling.

FIG. 2.—Multiple bands on leaves of the variety D.1135.

FIG. 3.—Leaves of M.1900 S. Purple and black discoloration of bands and destruction of leaf tissue.

FIG. 4.—Collapsing leaves and incipient tangle top due to the spindle of immature leaves having become caught in the shredded portion of one of the collapsing leaves. Variety M.1900 S.

FIG. 5.—Final stages of the disease. The growing point is dead and the leaf spindle twisted and rope-like. This has been followed by a profuse production of side shoots, two of which have developed tangle top.

FIG. 6.—Section of a dead top of M.1900 S. illustrating the extraordinary twisting of the leaf spindle.

RUST IN WHEAT.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

THESE notes are intended to convey a brief popular account of rust which is almost invariably present in wheat crops and which at times practically ruins the crop. Rust is in the nature of a disease which is caused by a fungous parasite which lives within the leaves and stem of the plant. The "rust" observed consists of the brown spores of the fungus. These spores, known as *uredospores,* are produced in countless numbers and, blowing about in the wind, serve to carry the disease from plant to plant and from one paddock to another. If a spore alights on a healthy leaf or stalk in the presence of moisture, it germinates by sending out a long hair-like tube which penetrates the plant tissues and continues to grow inside them. This need for moisture on the surface of the leaf in which the spore is to germinate explains the occurrence of epidemics of rust only in damp weather.

After the spore has infected the leaf the first sign is a pale spot, which gradually enlarges and loses its green colour. After a few days the fungous threads which are ramifying inside the leaf come to the surface and produce a fruiting body, consisting of clusters of the uredospores just discussed.

Alternate Host.

In the latter stages of the disease black spores are produced on the stem. The black spore, known as a *teleutospore,* is a thick-walled resistant structure representing another stage in the life history of the fungus. It is of considerable scientific interest, and is very important in countries where barberry bushes exist, but of little practical significance in Australia. In England and other places the teleutospore stage remains dormant throughout the autumn and winter, then germinates to produce a third type of spore (*basidiospore*) which infects barberry leaves in the spring. Yet another type of spore is then produced on the barberry, and this latter, known as *æcidiospore,* serves for the initial infection of wheat crops. Thus, it is seen that two hosts are required for the continued existence of the rust fungus as it grows in spring on the barberry, in summer on wheat, and rests over winter as hard black spores. Once the epidemic is started it spreads through the wheat crop by means of the rust-coloured uredospores.

Oversummering of the Fungus.

In Australia the conditions are quite different, and considerable speculation has taken place as to how the fungus survives the intervening period between two crops. The problem is one of oversummering of the fungus, as the wheat crop, contrary to the conditions in older countries, is in an active growing state throughout the winter, and rust, though not abundant, can be found on careful search during this period. The uredospore is short-lived, and the teleutospore, which can survive long periods, cannot infect wheat save through the intermediate host, the barberry, and there is none of this bush of any consequence in Australia. Dr. Waterhouse, of the University of Sydney, has found that specimens of rust could be collected from stray wheat plants during every month of the year in all the important wheat-growing districts. He therefore came to the conclusion that it is carried over by the occurrence of the disease on these self-sown plants, which are found in protected situations

on headlands, &c., even in the best cultivated fallows. The general concensus of opinion is that there is no practical method of preventing this carryover from one season to the next.

Severity and Contributing Conditions.

The initial infection is then present, but rust is severe in certain seasons and not of any great consequence in others. This is largely due to the seasonal conditions, though, of course, the variety of wheat used has a big influence. Weather which is warm with abundant moisture in the atmosphere—such conditions as herald early summer storms—though the storms themselves may yield little rain—will aid the spread of rust. In a normal season rust is present when the wheat comes into ear, but only on the lower leaves, where it is sheltered from the drying action of the wind and sun. Given fairly dry weather during the ripening period, it will remain there doing no great harm. However, with a few still muggy nights and cloudy days or even showery weather, it will spread with remarkable rapidity up the stem and even on to the ear. If this occurs prior to the maturing of the grain the energy of the plant goes to feeding the fungus, and the grain suffers correspondingly, being reduced in quantity, light, and shrivelled. If the rust attack is early and severe, a promising crop may be rendered practically worthless. Late crops are, of course, particularly liable to rust, and any delay in the wheat due to the planting rains falling late, arrested development during a long hard winter, or frosting of the leading heads with consequent secondary development will tend to increase the severity of rust.

The losses are difficult to estimate, but the following figures give some idea as to their magnitude. In the United States in 1927, 60,000,000 bushels were lost through leaf and stem rust; in New South Wales the loss in 1903 was estimated at 3,000,000 bushels, and in 1916 at 5,000,000 bushels valued at over £2,000,000. No estimates of losses are available for Queensland, but it is generally recognised that they have been heavy. The last year of severe infestation was 1916, but in 1924 and in both 1930 and 1931 considerable reduction in yield occurred in many crops.

Physiologic Forms.

The rust fungi are a class of disease-producing organisms which affect a large variety of hosts, such as lucerne, peaches, and plums, roses, wattle trees, &c., but they are mainly diseases of the grasses and cereals. As a general rule, the different hosts are attacked by different species of rust, but a number of allied hosts may have the same species of rust. For example, stem rust of wheat is caused by a fungus known as *Puccinia graminis,* and the same fungus—or one that cannot be distinguished from it under the microscope—attacks also rye, barley, oats, and a number of grasses. However, it is found that spores from the fungus on wheat will infect only rye and barley, but not oats and the grasses. The strain on wheat, rye, and barley on the one hand, and that on oats on the other, and various strains on grasses, are known as different physiologic forms. The position is even more complex than this, for the strain on wheat consists of a large number of forms. These differ in their virulence and in the amount of resistance shown them by certain partially rust-resistant wheats. For example, Canberra wheat is resistant to Forms 43, 44, and 54, but susceptible to Forms 45, 46, and 55, while another wheat, Thew, is just the opposite, being resistant to 45, 46, and 55, but susceptible to 43, 44, and 54. It can readily be

understood that the presence of these physiologic forms complicates the problem of breeding wheats for rust resistance. Waterhouse has investigated the physiologic forms of rust in Australia, and has brought to light some remarkable facts. From 1921, when the investigations were commenced, up till 1925 six different forms were found, Form 43 being the most common. In 1925 another form not previously recorded (No. 34) was found in Western Australia. In 1926 it was also found in several localities in New South Wales and South Australia. By the following year it had invaded all the States, and was the most abundant form. By 1929 it so dominated the rust picture that no other form was found occurring naturally. Waterhouse also reports that after having bred a promising variety—Euston—resistant to all six forms of rust present prior to 1925, but which proved to be susceptible to the form appearing in that year, he has now a cross from Euston which is resistant to the new form as well. This crossbred, or rather series of selections from a crossbred, is still passing through the stage of breeding up and testing.

Leaf Rust.

In addition to stem rust on wheat there are also yellow rust and leaf rust, the former not being present in Australia. Leaf rust, as its name suggests, is practically confined to the leaves of the plant, usually only the lower leaves. It is not capable of such sudden severe onslaughts as is stem rust, which attacks both leaves and stalks, but it appears earlier in the season, and by a constant small drain on the vitality of the plant is probably responsible for a much greater loss than is generally realised. There are at least two physiologic forms of leaf rust in Australia, and any complete scheme for breeding rust-resistant wheat must take them into account.

Control Measures.

While appreciation of the cause of the disease and the conditions under which it develops is very desirable, the grower is most concerned with the possibility of controlling the trouble or to some extent reducing its intensity. Many diseases of fruit trees or valuable crops grown on a small acreage can be controlled by the application of protective sprays. Experimentalists in Canada have demonstrated that similarly wheat rust can be combated by dusting with sulphur several times during the critical period, but the cost of the materials and the difficulties of application prevent this method being regarded as a practical solution of the problem at present. Seed treatment is of no avail, and quarantine measures out of the question where the disease is already right throughout all the wheat-growing areas, and, as stated earlier, persists from season to season on stray seedlings which will grow in a few sheltered situations even with the best cultural practices.

The only available line of control lies in the use of resistant varieties. While the perfect resistant variety is not yet available, much has been done to relieve rust of its worst perils. Resistant varieties can be divided into two classes—the first, those that show a certain degree of true immunity to rust—i.e., those that will not be severely attacked however favourable the conditions; and the second, the early-maturing varieties which could be more correctly referred to as rust-escaping varieties. These latter will, if grown out of season, be just as liable to rust as any others, but will normally come quickly into ear and mature a crop before the onset of the warm stormy weather which allows the spread of a rust epidemic. Such varieties as Florence and Clarendon—two wheats bred

by William Farrer and Pusa—an Indian wheat, belong to this class. So also do a large number of the more recent crossbreds produced by Mr. Soutter at the State Farm at Roma. Among these mention might be made of Watchman, Novo, Beewar, and the Bobs Indian Pearl Manitoba crosses, known under the initials B.I.P.M. The objection to growing early varieties is that in an endeavour to escape "rusty" weather they may be brought into ear while there is still a danger from late frosts.

On the other hand, most of the varieties showing true resistance are of the small hard-grained low-yielding type not suitable for cultivation. The aim of the plant breeder is to combine the resistant qualities of these wheats with high-yielding capacity, good-quality grain, drought resistance, &c. Of the better type wheats bred locally Three C's appears to be the best rust resister to date. In the Southern States there are a few other wheats which appear to show a certain degree of true resistance. All these wheats, however, can suffer severely from the effects of rust under some circumstances. Mr. Soutter, the Department's wheat breeder, also has a few later crossbreds which are more promising. They are, however, not yet fully tested out nor bred up to the stage where they can be liberated, so nothing definite can be stated as yet. The same applies to a number of new wheats in the other States which have been favourably reported upon. It is hoped that from the continued efforts of the practical breeders there will shortly be evolved a number of wheats with a high degree of rust resistance, such that suitable ones may be chosen for each particular wheat-growing area.

GRAIN SORGHUM FOR PIGS.

Included among grain crops for pig-feeding purposes and specially recommended for districts where conditions are not as favourable to the growth of maize as is desirable, grain sorghums are worthy of trial.

Grain sorghums differ from sweet sorghums in being free from the sugary juices of the latter, in being more hardy, and in producing valuable grain crops. They differ from maize in being hardier, and in producing grain crops where maize fails to do so. They are usually shorter in growth; the grain is small, and is borne in dense compact bunches at the top of the stalk and not on cobs. They are not readily affected by hot winds when flowering—a frequent cause of bad cobbing in maize. They are also less affected by the presence of small amounts of salt in the soil. The grain is almost equal to maize in feeding value. It may be fed to all classes of stock, preferably after being crushed or cracked. It is fed to poultry after crushing, and is used with the morning mash in proportions up to 10 per cent.

In pig feeding it is also desirable to crush, soak, or cook the grain, otherwise a large percentage is wasted and best results are impossible. For roughage, the stalks may be harvested with heads intact when the grain is dry and hard, and in stacking the heads should be protected by being placed towards the centre of the stack. As required, the stalks are given to the pigs who make good use of the grain; though, as stated, a good deal of waste results in this system.

Milo meal may be purchased from some produce stores, and is generally valued at much the same price as pollard. Grain sorghums are grown mostly on the Darling Downs, but are suitable also for many other districts. Varieties of grain sorghums specially advised for Queensland conditions include: Red Kaffir, White African, and Fetenita.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PESTS OF COTTON IN THE CALLIDE VALLEY.

By D. O. ATHERTON, B.Sc., Assistant to Entomologist.

THE weather conditions prevailing throughout the 1931-1932 season were abnormal in the sustained high temperatures and low rainfalls recorded. During the six months from October, 1931, to March, 1932, inclusive, the total rainfall at the Callide Cotton Research Farm amounted to little more than 7 inches, and of this only one effective fall—115 points—occurred in 1932. On many occasions the daily maximum shade temperature rose above 100 degrees F. and seldom fell below 90 degrees F. It is suspected that this unusual weather was in some way either partly or wholly responsible for the unusual insect population encountered in cotton. Of the Lepidoptera concerned in the economy of this crop five species caused appreciable losses, and of these the cotton leaf perforator (*Bucculatrix gossypii* Turn.), the rough boll worm (*Earias huegeli* Rogen.), the brown cutworm (*Euxoa radians* Guen.), the corn ear worm (*Heliothis obsoleta* F.), and the looper (*Antarchæa chionosticta* Turn.) are discussed in more or less detail in the following pages. The looper has not previously been recorded as a pest of Queensland cotton, and although specimens of the cotton leaf perforator were collected by Mr. A. A. Girault in 1923 from cotton it was evidently regarded as a pest of no importance. During the season under discussion, however, both these species, particularly the looper, occasioned losses on an extended scale. It was a late season owing to the comparative failure of the November rains in 1931, and very little cotton was planted before mid-December of that year.

The Cotton Leaf Perforator (Bucculatrix gossypii Turn.).

This tiny Tineid has not previously been regarded as a pest of cotton in Queensland, but during the season under discussion it accentuated the losses of some growers in the Callide Valley.

As is the case with all other species to be discussed presently, the larva is the stage which is destructive to the cotton plant. In this species it is a very small light-green caterpillar up to a quarter of an inch in length which destroys either the mesophyll alone or whole areas of the leaf attacked; in the latter case feeding generally takes place from the ventral surface of the leaf.

Nature of Injury.

The larva excavates small tortuous mines between the upper and lower epidermis of the leaves; these mines apparently follow no particular pattern, but are always tortuous, and may even form complete loops. The frass or excreta is deposited irregularly in the mine in tiny hard pellets. The mine, however, is not the most striking injury to the casual observer, "shotholes" in the leaves being generally more noticeable. The older leaves at the base of the plant are usually slightly more fleshy than those formed when the plant has grown higher, and are the first to be attacked. In mild infestations the activities of the larvæ may not extend beyond the few leaves near the ground, but in severe infestations fully-grown leaves on any part of the plant may be attacked, and in the worst cases observed the "shotholes" or feeding sites were so numerous and extended that most of the leaves of mature size presented a skeletonised appearance. This restriction in the area available for photosynthesis acted as a severe check on the growth of the plant.

Life History.

The egg has not yet been discovered, but it is very likely to be so small that detection by the naked eye is improbable. The larva, probably soon after emergence from the egg, eats its way through the epidermis of the leaf and commences feeding on the chlorophyll-bearing tissue between the upper and lower surfaces. It lives in this protected situation for some days, gradually forming a tortuous mine of ever-increasing width, which finally attains a length of about three-quarters of an inch. On the completion of the leaf-mining phase the larva, which is then about one-eighth of an inch in length, tears its way through the epidermis covering the larger end of the mine. Before feeding commences outside the mine a resting phase is passed under the shelter of a roughly circular, silky, yellowish structure built on the surface of the leaf. After emerging from this shelter the larva feeds on the leaf lamina, removing the small distinctive "shothole" areas, which are often about one-eighth of an inch across. The full-grown larva is about a quarter of an inch long, light-green in colour, and mottled with slightly lighter areas on the dorsal aspect of each abdominal segment. The pupa is formed in a yellowish silken cocoon, which is longitudinally ribbed and closely apressed to a sub-stratum of leaf surface, stem, or clod of soil. Prior to eclosion of the imago, the pupa makes its way partly out of the cocoon, and after this final ecdysis the pupal exuvium is left projecting from the old cocoon. The adult is a small inconspicuous grey moth about one-quarter of an inch long, and bears several darker spots along the axis of each forewing.

Importance of the Pest.

It is not anticipated that this species will be a pest in a normal season, but during the 1931-1932 season its depredations checked the growth on many cotton fields. In one instance, at Valentine Plains, plants which had almost ceased growing owing to the drought were practically defoliated.

The Brown Cutworm (Euxoa radians Guen.).

This comparatively well-known cutworm requires no further description here. During the season only one instance of damage to cotton was noted, and in this case about 1 or 1½ acres of very young cotton were destroyed on an area of land which had been very dirty with the weed *Tribulus terrestris* (Bull Head) while lying fallow. An investigation disclosed the brown cutworm in numbers on this area.

The Corn Ear Worm (Heliothis obsoleta F.).

This is another species which is too well-known to need much further description. Corn ear worm, tomato fruit worm, tobacco budworm, and American boll worm of cotton are some of the popular names by which it is known. The larval stage is chiefly remarkable for its voracious appetite and an astonishing colour range. Colours range from light-green to almost black, but lighter-coloured dorsal stripes running the length of the body are always discernible in the darker specimens. Some of the lighter-green specimens have been noted with cerise-coloured areas surrounding each abdominal spiracle. This colour range of the corn ear worm is well illustrated by Garman and Jewett.[1]

Nature of Injury.

Terminal growth buds, young foliage, squares, and bolls are all attacked, but the greatest losses are caused by its habit of excavating squares and bolls in all stages of development.

Seasonal History.

Late in December, 1931, the first eggs were discovered on young cotton—most of the fields had not been planted until the advent of the December rains which fell early in the month. By the end of January numbers of larvæ had emerged from the early eggs, and in one field a severe infestation was noted. On the Research Farm egg-laying reached a maximum in the first week of February, and the largest numbers of larvæ were present about one week later, and, especially in the maize, towards the end of that month. From this time onwards the activity of the corn ear worm decreased, and before the end of March had practically ceased. It must be emphasised that these terms are relative only; at no time during the season was the pest sufficiently numerous to cause any alarm.

Natural Enemies.

Several species of Tachinidæ are active parasites, and the predators include Sphecidæ and the Pentatomid *Œchalia consocialis* Bd.

Importance of the Pest.

This species has been regarded as the most serious insect pest of cotton in the Callide Valley for some years, but in the 1931-1932 season it caused very little loss.

The Rough Boll Worm (Earias huegeli Rogen.).

The rough boll worm, the common name given to *Earias huegeli,* is well known in Queensland and other cotton-growing countries, and detailed descriptions have been published by Ballard in 1927 [2] and others.

Nature of Injury.

The terminal growing shoot of the main stem is often destroyed, and this induces excessive vegetative development of the plant which is inimical to the production of a heavy crop. Squares and bolls of all sizes, from tiny squares one-eighth of an inch across to almost full-grown bolls, may be attacked. Damage to the bolls often results in the introduction of bacterial and fungal rots which cause an offensively odoriferous frothing to occur, and result in the destruction of the whole boll.

Seasonal History.

Terminal losses and the loss of tiny squares due to the rough boll worm were first noticed in January, 1932; after that month losses steadily increased until the end of March, and thenceforth remained more or less constant until the end of April, when observation was discontinued.

Natural Enemies.

These include at least two Tachinids, and possibly three (they have not yet been identified), a small Braconid, and *Œchalia consocialis.*

Importance of the Pest.

The rough boll worm has not previously been regarded as a serious menace to the Queensland cotton crop, but it has caused greater losses during the recent season than any other pest of cotton. In many cases the percentage of squares destroyed has amounted to 50 per cent. of the total number of squares formed by the plant, and in other instances the figure is still higher. From the data collected this season it is thought that either the rough boll worm has been overlooked to some extent in

the past, and losses caused by it attributed to the corn ear worm, or alternatively that the very droughty conditions in early 1932 have favoured the rough boll worm to the exclusion of other species of lepidopterous cotton pests.

The Looper (*Antarchæa chionosticta* Turn.).

This Noctuid insect, which has not previously been recorded as a pest of cotton in Queensland, made its appearance in numbers during the season. It is, of course, a pest in the larval stage, as is the case with the other species already discussed. The species has been described by Dr. A. J. Turner, and it is expected that the description will appear at an early date.

Nature of Injury.

The foliage is attacked by larvæ of all stages, the tiny young caterpillars concentrating on the leaf tissue between the veins of young leaves. Larger larvæ eat almost the whole of the leaf lamina, leaving only the larger veins, but it is only the succulent young growth which is destroyed, the harsh old foliage being avoided. When present in large numbers on a young succulent plant these loopers leave very few leaves intact, thus giving the plant a very bedraggled appearance. The indiscriminate feeding on succulent tissues often results in severe losses of terminal growing shoots, and many of the tiny squares clustered there. At times larger squares are attacked, but no instance of damage to bolls by loopers was noticed.

Life History.

The eggs may easily be mistaken for those of the corn ear worm when observed by the unaided eye, as they are similar in size and shape, and bear somewhat similar meridional ribbing. The top of the egg, however, is crowned with a circle of chorionic processes, and the colour is slightly greenish-blue in contrast to the pearly-white of corn ear worm eggs; these differences are distinctive when a lens is used.

The larva when full grown is one and a-quarter to one and a-half inches long, often green, with four dorsal black spots on each segment, and other black spots on the sides of each segment, and with two white latero-dorsal stripes running the length of the body. But the whole dorsal region may be darker, even nearly black, in colour with the latero-dorsal stripes widened to include the black spots. There may also be two or three additional white stripes on each side. When the larva is full grown it ceases to feed, shrinks slightly in length, and before pupating in the loose soil at the base of the plant changes colour to a decided reddish-pink. Pupation takes place at or just below the surface of the soil near the base of the plant. The larva spins a very flimsy silken cocoon, to which many soil particles become attached. The pupa is dark-brown in colour and one-half to five-eighths of an inch in length; some eight to twelve days are passed in this stage before the moth emerges.

The imago has a body about half an inch long and a wing expanse of approximately 1 inch. The forewings are stone to fawn coloured, sometimes with a greenish tinge, and bear two tiny white spots one-eighth of an inch apart along the axis of the median cell of each. The hindwings are dull creamy white with a shaded pinkish-brown area extending from the anal angle to the apex and bordered with a fringe of short white hairs.

Eggs are laid anywhere on the foliage or squares, but usually on the succulent leaves near the apices of vegetative branches.

The loopers are very active, and when disturbed are apt to escape by a sudden galvanic wriggle of the whole body which may throw them as far as 12 to 18 inches away from the scene of interference. Their efforts to escape when attacked and pierced by *Œchalia* are extremely violent, and in some cases both captor and captive are flung about for several minutes, so convulsive are the spasmodic efforts of the looper to dislodge its enemy.

Seasonal History.

Looper caterpillars were present in all fields examined as early as the third week of December throughout the Callide Valley, and continued their onslaughts with undiminished vigour until March, despite the presence of many natural enemies. All stages in the life history of the pest could be taken throughout these three months, but the greatest numbers of both loopers and moths were to be found during February. After the early part of March few individuals were to be found, and it is thought that this sudden cessation of activity may be at least partly explained by the accumulated effect of natural enemies.

Importance of the Pest.

This pest is a severe check to the plant early in life, particularly in a season such as that under discussion, when the growth is not vigorous. Some squares are lost after they are well developed, but more losses of squares are due to the indiscriminate feeding on succulent growth near the main and branch terminals. Severely attacked fields presented a very ragged appearance as though they had been swept by a horde of army worms.

No control experiments were attempted, but it is likely that dusting with arsenicals such as calcium arsenate or lead arsenate would prove effective. Results from experiments with bait pails suggest that this may prove a promising avenue of investigation.

Natural Enemies.

Quite a number of insects are suspected of being useful in this role, and a number are known to be beneficial. The latter include *Ammophila suspiciosa* Sm. (Sphecidæ), *Chalcis ruskini* Gir., and *Chalcis rufifemur* Gir. (Chalcididæ), *Œchalia consocialis* Bd. (Pentatomidæ), and two or possibly three Tachinidæ (these are not yet identified).

Œchalia is a predator on all three serious lepidopterous pests mentioned in this paper, and would be a much more effective control were it not for the activities of the wasps *Telenomus* sp. and *Pachycrepis tectacorisi* Gir., which parasitise most of the eggs laid early in the season.

The Chalcids (*Chalcis ruskini* Gir. and *Chalcis rufifemur* Gir.) were probably a prominent factor in finally checking the looper in February and March, as out of ten pupæ collected in the field at this time seven were parasitised by these species.

References.

(1) Bulletin No. 187, Kentucky Agricultural Experiment Station, 1914, by H. Garman and H. H. Jewett.

(2) Cotton Growing in Queensland, Parts I. and II., by W. G. Wells and E. Ballard, 1927.

EXPERIMENTS IN THE TREATMENT OF STOMACH WORMS IN SHEEP.

By F. H. S. Roberts, M.Sc., Entomological Branch.

A SURVEY of the helminth parasites of sheep in Queensland extending over the past two years has indicated that parasitic gastro-enteritis is mainly due to infestation by the stomach worm, *Haemonchus contortus*. The nodule worm, *Oesophagostomum columbianum*, the lung worm, *Dictyocaulus filaria*, and the tapeworm, *Moniezia* sp., are the causes of occasional losses, but by no means rival *H. contortus* in their pathogenicity.

In portions of the Southern States parasitic gastro-enteritis is stated to be due mainly to the smaller *Trichostrongyles, Trichostrongylus sp., Ostertagia sp.*, and *Nematodirus filicollis*. These smaller nematodes are known from Queensland sheep, but as far as can be determined are of minor importance only.

The stomach worm, *Hæmonchus contortus*, was first reported in 1876, and even at that time was noted as causing heavy losses on the Darling Downs. At the present time the parasite is present over a good portion of the State, the area of infestation extending from the coast to the Warrego River in the South and to Jericho in the Central West. Generally speaking, the parasite may be said to be confined in its outbreaks to those areas in receipt of an average annual rainfal of about 20 inches or over. In districts with a lower rainfall any outbreak can usually be traced to animals which have been agisted on coastal country during dry times and brought back after rain.

PREVIOUS WORK IN AUSTRALIA.

The first recorded work in Australia in the treatment of parasitic nematode infestation in sheep is that of Henry. Arsenic, copper sulphate, and creosote were among the drenches used, and it was evident that the treated animals improved, but not to the same extent as those given improved feeding. Dodd (1908) recommended the use of copper sulphate and mustard, but no records are available as to any tests he may have carried out. Brown advocated arsenic and magnesium sulphate (epsom salts), which is still used to a large extent in Queensland at the present time. Whitehouse tested copper sulphate and copper sulphate and sodium arsenite, but did not obtain the same success as with his own formula, which consisted of arsenious acid, copper sulphate, and hydrochloric acid. Seddon and Ross conducted a large series of trials in 1927 in which numerous drugs were used. As a result, copper sulphate and mustard was regarded as being the most efficient remedy for *H. contortus*. High efficiencies were obtained from carbon tetrachloride, also. Ross, from experiments in Central Queensland, advises the use of carbon tetrachloride and mentions that copper sulphate also gave good results. Carew in 1929 conducted a series of tests in which arsenic and magnesium sulphate, copper sulphate and mustard, various mixtures of dichlorobenzol, carbontetrachloride, and a mixture of arsenic, copper sulphate and magnesium sulphate were employed. All except the dichlorobenzol mixtures proved satisfactory, with the arsenic, copper sulphate and epsom salts combination considered the most rapid in its action and the most efficient.

In the earlier experiments the efficiency of the drugs used was judged mainly by the improvement in the condition of the animals treated, occasionally aided by rough observations on the number of worms passed or on the number present on post mortem. The tests of Seddon and Ross, and most probably those of Ross, were, however, conducted on a different basis, and represent the first attempts in Australia to gain some idea of a drug's anthelmintic value by comparing the number of worms present before and after treatment, the efficiency being denoted in mathematical terms.

Anthelmintics Tested.

The principal anthelmintics in use against *H. contortus* in various parts of the world are (*a*) Carbon tetrachloride, (*b*) tetrachlorethylene, (*c*) copper sulphate, (*d*) copper sulphate and mustard, (*e*) arsenic and magnesium sulphate, (*f*) arsenic and copper sulphate.

Carbon tetrachloride is used in England and the United States, and is recommended in Australia by the Council for Scientific and Industrial Research. Copper sulphate alone is regarded as highly efficient in parts of the United States and in England, and is the Departmental drench in South Australia and West Australia. In New South Wales and Queensland copper sulphate in combination with mustard is used. Sodium arsenite and copper sulphate is the famous Veglia compound employed in South Africa. In Queensland Carew's copper sulphate, arsenious acid, and magnesium sulphate mixture is extensively applied. Arsenic and magnesium sulphate is still retained by many Queensland pastoralists as an efficient vermicide, and tetrachlorethylene has in the past few years come into prominence in the United States as an anthelmintic of reputed high efficiency.

In the choice of an anthelmintic several points must be kept in mind. The drug to be used must be safe, easily administered, inexpensive, and of high efficiency in one or two applications. The initial experimental work has, therefore, been to test under Queensland conditions the various drugs which have been accounted efficient elsewhere. In the present series of tests the anthelmintics used consisted of (*a*) carbon tetrachloride, (*b*) copper sulphate and mustard, (*c*) arsenic and magnesium sulphate, (*d*) tetrachlorethylene, and (*e*) sodium arsenite and copper sulphate. Copper sulphate was used in admixture with mustard as the combination has been in use in Queensland for some time and is, moreover, considered by Seddon and Ross to be more efficient against *H. contortus* than copper sulphate alone. Arsenic and magnesium sulphate was included as it had been favourably reported on by many pastoralists in various parts of the State. Of the arsenic and copper sulphate mixtures, that used in South Africa was selected in view of its reputed high efficiency in that country and also because of the contradictory results obtained by Seddon and Ross in New South Wales. In addition to these five drenches, sodium fluosilicate was included at the suggestion of Dr. I. Clunies Ross, Parasitologist to the Council for Scientific and Industrial Research.

Methods Used.

The most accurate method of determining the anthelmintic value of any drug is to treat a group of animals with the drug chosen, collect and count all worms passed over a number of days, and compare them

with the number of worms unaffected by the treatment and collected from the animals on post mortem. Unfortunately, this method is not a success with helminths infesting the stomach, as the dead worms become subjected to the process of digestion and only a small percentage of those killed may be passed. Hall and Foster, for example, using copper sulphate on three sheep, obtained 120, 240, and 314 *H. contortus* from the dung, a post mortem showing 0, 49, and 3 worms still present in the stomach, while two other untreated sheep from the same flock yielded 4,000 and 6,000 respectively.

The egg count method has been used by a number of workers whereby the efficiency of a drug may be computed by a comparison of the number of eggs per gram weight of foeces before and after treatment. As it is exceedingly difficult to distinguish the eggs of many of the sheep nematodes, the method is obviously useless where only one of these species is concerned. The respective larvæ, however, may be readily recognised and from fæcal cultures an indication of the anthelmintic value could be obtained. The method, however, is regarded as somewhat inaccurate and restricting when it is considered that the character and amount of fæces passed depends to such a large extent on the health of the animal and the nature of the food supplied, and that, moreover, only the female worms would be considered.

After due consideration it was decided to use the method employed by Seddon and Ross. By selecting a flock of sheep which had been running under identical conditions for some time prior to the experiments, retaining an adequate number of controls, and comparing on post mortem the average number of worms remaining in the treated and control animals, it is considered that the efficiency of the anthelmintics used can be computed to a fair degree of accuracy. Although it is recognised that parasitic infestation in animals of the same age and which have been running under similar conditions may vary within wide limits, the use of a sufficiently large number of animals, both for treatment and control, should obviate this variable infestation to a large extent. The adult sheep used in these tests consisted of three to five year old wethers, which had been running under the same conditions for the past three years. The lambs were mixed sexes about five months old which had been together since birth. As far as possible the number of animals retained for both treatment and control was five, but in some cases this number was not available. In view of the wide variation in the infestation of the adult controls, from 186 to 1,621, it was considered that more accurate interpretations would be obtained if the controls were increased from five to eight animals. The heavy infestation among the lambs resulted in such a weakened flock that some anxiety was experienced in giving the full lamb dose of each of the drugs. The lambs were also heavily infested with *Moniezia* sp.

Sodium fluosilicate was given in a hard capsule. The remaining animals to be treated were starved for up to 18 hours before and for four hours after treatment. Killing was commenced four and five days after treatment in the case of the adults and lambs respectively.

The fourth stomach was tied off, removed, and opened into a bucket of water. The ingesta was carefully washed off and the stomach, with the majority of the worms still attached, thoroughly washed in another bucket till all worms were removed. The contents of this

second bucket were then examined in a large flat glass dish. The ingesta was subjected to about three or four washings and decantations and examined in a similar manner. Lastly, the decanted fluid was searched for any worms which may have been poured off.

The anthelmintic efficiencies were computed by comparing as a percentage the average worms remaining per treated sheep with the average number per control.

The worms collected from the control sheep are given in Table No. 1.

TABLE No. 1.

CONTROLS.

No. of Sheep.	Class.	No. of *H. contortus* Present.
1	Adult	186
2	ditto	588
3	ditto	563
4	ditto	535
5	ditto	1,467
6	ditto	975
7	ditto	490
8	ditto	1,621
9	Lamb	3,624
10	ditto	2,646
11	ditto	2,978
12	ditto	2,886
13	ditto	4,241

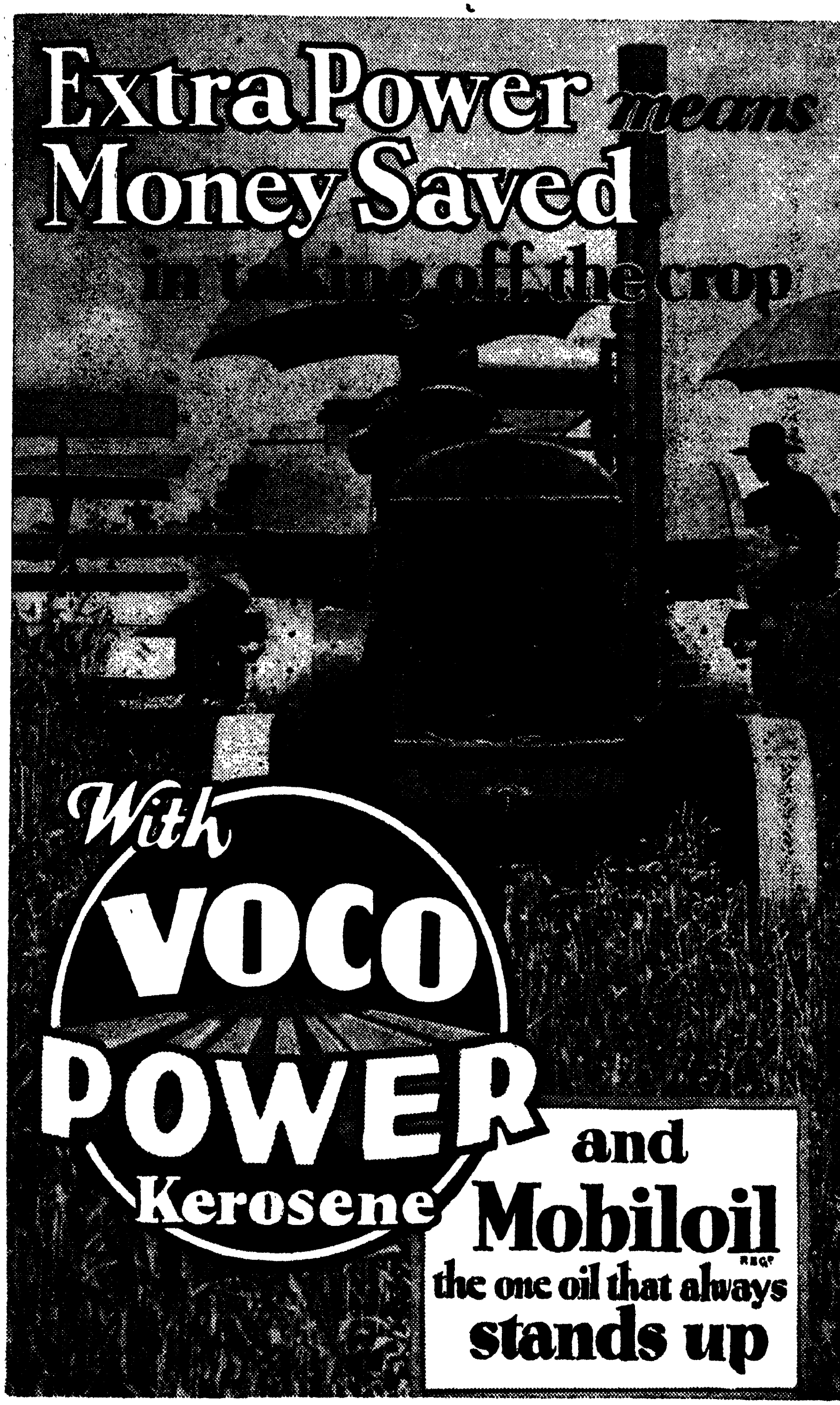
Total worms, adults, 6,425; average worms per adult, 803.
Total worms, lambs, 16,375; average worms per lamb, 3,275.

EXPERIMENT No. 1.

Copper Sulphate and Mustard.

The use of copper sulphate as an anthelmintic against *H. contortus* was first developed by Hutcheon in South Africa. The doses ranged from ¾ oz. to three-month old lambs to 3½ oz. to sheep two years and older of a solution obtained by dissolving ·45 kgm. copper sulphate in 35·96 litres of water. In America Hall and Foster, using 50 c.cs. of a 1 per cent. solution (7½ grains) were successful in removing 98 per cent. of the worms from three lambs. Dodd recommended the addition of mustard, the adult dose being 17·5 grains of each. Seddon and Ross obtained better results against *H. contortus* with copper sulphate and mustard than with copper sulphate alone.

Wright, after a series of tests with mustard alone, claimed that it was ineffective against *H. contortus*. Against *Ostertagia* Seddon and Ross obtained an indication of an efficiency with a 36-grain dose to a lamb. Not much reliance, however, can be placed on this test, as only one animal was treated. From their results with copper sulphate it would certainly appear that mustard either possesses some anthelmintic value, or in some way or other its inclusion increases that of the copper sulphate.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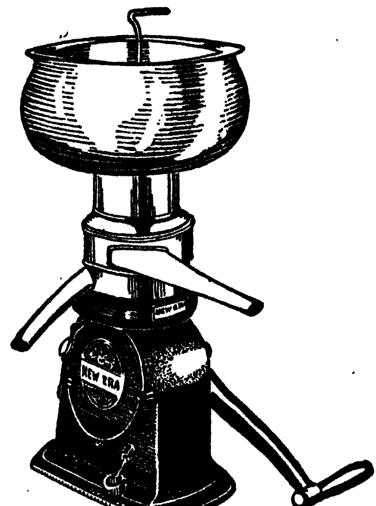

In New South Wales the formula in use is 8 oz. copper sulphate and 8 oz. mustard to 6 gallons water. In Queensland the amount of water is reduced to 5 gallons, which raises the adult dose from 14·6 grains of each ingredient to 17·5 grains. In South Australia, Western Australia, the United States, and England, copper sulphate alone is still used, the respective adult doses being 14·6 grains in South Australia, 11 grains in Western Australia, 15·43 grains in the United States, and 17·5 grains in England.

The formula used in Queensland consists of 8 oz. copper sulphate and 8 oz. mustard to 5 gallons of water. The adult dose is 4 fluid oz., which contains 17·5 grains of each ingredient, the lamb dose 2 fluid oz., containing 8·75 grains of each. The results of treatment with this mixture are given in Table No. 2.

TABLE No. 2.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
14	Adult	17·5 grains of copper sulphate and 17·5 grains of mustard	10
15	ditto ..	ditto	163
16	ditto ..	ditto	462
17	ditto ..	ditto	14
18	ditto ..	ditto	201
19	Lamb	8·75 grains of copper sulphate and 8·75 grains of mustard	214
20	ditto ..	ditto	315
21	ditto ..	ditto	1,265
22	ditto ..	ditto	652
23	ditto ..	ditto	278

Total worms remaining in adults, 850; average per adult treated, 170; average number worms per control adults, 803; efficiency therefore 79 per cent.

Total worms remaining in lambs, 2,724; average per lamb treated, 545; average number worms present per control lamb, 3,275; efficiency therefore 83 per cent.

OBSERVATIONS.—Copper sulphate and mustard in the doses administered showed a fairly high anthelmintic efficiency, removing on the average a larger number of worms from the lambs than from the adults. In the case of adults Nos. 14 and 17 it is noted that only 10 and 14 *H. contortus* were recovered on post mortem, indicating an efficiency approaching 99 per cent., assuming that they averaged the same number of parasites originally as the controls. Even when compared with control No. 1, which contained only 186 worms, the efficiency is still high—about 92 per cent. Three of the lambs yielded comparatively few worms, the other two 652 and 1,265 respectively. If No. 21 is omitted from the results the efficacy would, with the average worms of the remaining four sheep as 365, have been approximately 89 per cent. These results are somewhat in agreement with those of Seddon and Ross, who obtained removal percentages in starved lambs on a 7½-grain dose of 77 to 99, and also confirm their assertion that, whilst this drench will remove the majority of the worms from some animals, it will leave

a considerable proportion in others. It is difficult to compare the results given in this case by the 17·5-grain dose with those obtained in New South Wales by a 14·6-grain dose, but the comparison appears in favour of the larger dose.

EXPERIMENT No. 2.

Carbon Tetrachloride.

Hall and Shillinger found that doses of 12, 18, 24, and 48 c.cs. of carbon tetrachloride in 2 oz. castor oil removed all the *H. contortus* from the four lambs treated. A dose of 4 c.cs. proved 98 per cent. efficient, and indicated that this dose was too small to remove all the infestation. A 10-c.c. dose followed by 4 oz. magnesium sulphate was 100 per cent. efficient in three further sheep, a check animal showing 1,434 worms. Hall also notes that a 5-c.c. monthly dose to four animals removed all the worms from three sheep and left about fifty in the fourth. Montgomerie found a 1-c.c. dose to cause a large decrease in the egg count, whilst a 5-c.c. dose showed on autopsy to have removed all the *H. contortus*. Seddon and Ross found that 5-c.c. doses to two adults, and 2½ c.cs. to five lambs gave better results than any other drug tested. With a reduced adult dose of 2 c.cs. 76 per cent. of the worms were removed, though further tests with a 1-c.c. adult dose gave an efficacy of 81 per cent. The same dose to eight lambs removed 76 per cent. of the nematodes. Ross found that 2 c.cs. in 8 c.cs. of liquid paraffin gave the best results of the anthelmintics tested. The percentage efficiency is not stated. His recommendation was for an adult dose of 2 c.cs. and a lamb dose of 1 c.c. given in liquid paraffin to make a total dose of 5 c.cs. Carew tested this 5-c.c. mixture, and in one case found numerous *H. contortus* still alive twenty-four hours later. In another animal only a few worms were still present.

Five adult sheep were given 2 c.cs. of carbon tetrachloride in 3 c.cs. of liquid paraffin, and five lambs 1 c.c. of carbon tetrachloride in 4 c.cs. of liquid paraffin, in accordance with the recommendations of Ross. A further lot of three adult sheep were each given 5 c.cs. of carbon tetrachloride in order to observe the effect of the larger dose. The results obtained from the use of this drug are shown in Table No. 3.

TABLE No. 3.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
24	Adult	2 c.cs. carbon tetrachloride in 3 c.cs. liquid paraffin	128
25	ditto ..	ditto	92
26	ditto ..	ditto	31
27	ditto ..	ditto	253
28	ditto ..	ditto	136
29	ditto ..	5 c.cs. carbon tetrachloride	20
30	ditto ..	ditto	4
31	ditto ..	ditto	nil
32	Lamb	1 c.c. carbon tetrachloride in 4 c.cs. liquid paraffin	71
33	ditto ..	ditto	29
34	ditto ..	ditto	324
35	ditto ..	ditto	210
36	ditto ..	ditto	834

Total worms remaining in adults given 2 c.cs. carbon tetrachloride, 640; average worms per treated adult, 128; average worms per control adult, 803; efficiency therefore 85 per cent.

Total worms remaining in adults given 5 c.cs. carbon tetrachloride, 24; average worms per treated adult, 8; average worms per control adult, 803; efficiency therefore 99 per cent.

Total worms remaining in lambs given 1 c.c. carbon tetrachloride, 1,468; average per lamb treated, 293; average worms per control lamb, 3,275; efficiency therefore 91 per cent.

OBSERVATIONS.—These results indicate that, whilst the 2-c.c. and 1-c.c. doses for adults and lambs gave relatively high efficiencies, 85 per cent. and 91 per cent., respectively, 5 c.cs. removed practically all the nematodes from the three sheep treated. Hall has shown that sheep will tolerate 1·3 c.cs. per kilogramme of body weight, the minimum lethal dose being about 2 c.cs. per kilogramme. Daubney, however, found that at a dose rate of ·1 c.c. to ·2 c.c. per lb. body weight, four out of nine sheep died, but with smaller doses up to 3 c.cs. no fatal symptoms followed. In New South Wales a 1-c.c. dose is in use against the liver fluke *Fasciola hepatica*, and occasional reports of the toxicity of this small dose have been made. On the other hand, 5 c.c. adult doses are in use in England and America, and are evidently regarded as safe, for otherwise they would have been reduced. In Queensland, moreover, the 2-c.c. dose is in regular employment in several districts, and no adverse reports of its safety have been received. Its recommendation by Ross must be regarded as another factor in favour of the opinion of the drug's safety.

It is felt, therefore, in view of the high efficiency and relative safety of the 2-c.c. dose, that it would be unwise to increase the dose to any extent.

The addition of a purgative to carbon tetrachloride has been found to decrease its toxicity without in any way impairing its anthelmintic value. Magnesium sulphate has been used for this purpose by Hall and Shillinger and Daubney, the latter being able to increase the amount of carbon tetrachloride to ·2 c.c. per lb. body weight without any toxic symptoms following. In Australia liquid paraffin has been in use as the accompanying purgative for some time, and it is thought that tests with this against other purgatives may be well worth considering.

EXPERIMENT No. 3.

Tetrachlorethylene.

Tetrachlorethylene owes its reputation as an anthelmintic for *H. contortus* to Schlingman, who was able to report the complete removal of all worms with 5-c.c. to 20-c.c. doses. Turner and Moon, using monthly doses of 1 c.c. for every 10 lb. of body weight found that after seven months *H. contortus* was still present in three of the four lambs treated. Seddon and Ross, using a 2½-c.c. dose, removed 70 per cent. of the infestation from five lambs, whilst a further test with this dose gave a removal percentage of 84. In 5-c.c. doses to adults there was an average of 62 residual worms, as compared with 394 in the controls, an efficiency of 85 per cent.

The adult dose of 5 c.cs. and the lamb dose of 2½ c.cs. which were administered are in accordance with the recommendations of Schlingman *et al.* The results obtained from these doses are given in Table No. 4.

TABLE No. 4.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
37	Adult	5 c.cs. of tetrachlorethylene	482
38	ditto ..	ditto	364
39	ditto ..	ditto	220
40	ditto ..	ditto	410
41	ditto ..	ditto	48
42	Lamb	2½ c.cs. of tetrachlorethylene	Died
43	ditto ..	ditto	1,134
44	ditto ..	ditto	2,665
45	ditto ..	5 c.cs. of tetrachlorethylene	24
46	ditto ..	ditto	4

Total worms remaining in adults, 1,526; average per adult treated, 305; average worms per control sheep, 803; efficiency therefore 62 per cent.

Total worms remaining in two lambs given 2½ c.cs., 3,799; average per lamb, 1,899; average per control lamb, 3,275; efficiency therefore 42 per cent.

Total worms remaining in two lambs given 5 c.cs., 28; average per lamb, 14; average per control lamb, 3,275; efficiency therefore 99 per cent.

OBSERVATIONS.—The results of treatment with tetrachlorethylene are, in view of those obtained by other workers, very disappointing. With the five adult sheep evidence of a high efficiency is given in only one case, where 48 worms remained. The 2½-c.c. dose with the lambs gave an even more adverse indication of the value of this drug against *H. contortus*. The two lambs given 5 c.cs. yielded together only 28 worms, showing that at this dose rate for lambs a high efficiency may be expected. One of the lambs given a 2½-c.c. dose died. It was one of the weakest of the sheep treated, and expired about thirty hours after treatment. Tetrachlorethylene in 5 c.c. doses to lambs gave indications that this dose rate may be dangerous. The two lambs so treated evinced much distress after dosage, but recovered. Two other lambs, each given a 5-c.c. dose, collapsed five and ten minutes after treatment. Each of these animals was killed about fifteen minutes after administration of the drug, and on autopsy it was noticed that in each case the fourth stomach gave off the distinctive odour of the drug, and that the majority of the worms were either dead or stupified; at least, very few remained attached to the mucosa, the majority lying motionless among the stomach contents. These observations to a certain extent tend to confirm those of Taylor concerning the passage of fluids direct to the abomasum, and also indicate that tetrachlorethylene may act as a contact poison. It is pointed out that, in the case of these two lambs, the drug was administered very slowly, and that the collapse was not due in any way to the liquid entering the lungs.

EXPERIMENT No. 4.

Sodium Arsenite and Copper Sulphate.

Veglia, in a large series of experiments in which he endeavoured to ascertain the effect of repeated doses in obtaining a complete removal of all *H. contortus* present, found that a mixture of 125 mg. of sodium

arsenite (containing 80 per cent. arsenious acid) and 500 mg. of copper sulphate given to adult sheep on two successive occasions most nearly achieved his purpose. Even a single treatment removed a big percentage of the worms present. Sheather, in England, found that this dose caused a considerable decrease in the number of eggs passed. Whitehouse reported that the South African remedy was less effective than his own formula, which consisted of an adult dose of 10 c.cs. of a solution containing 60 grains arsenious acid, 180 grains copper sulphate, 12 c.cs. hydrochloric acid, and 8 oz. water. Seddon and Ross gave 2 grains sodium arsenite and 8 grains copper sulphate as a powder to four lambs and two adults, but their results indicated that the mixture even at these strengths possessed little if any anthelmintic efficiency. Sodium arsenite alone in 60 mg. doses to lambs gave an efficiency similar to that obtained with tetrachlorethylene. The Whitehouse mixture was given to two sheep only, which on autopsy showed 31 and 42 *H. contortus* as against an average of 166 in the controls. Carew, using a 2-oz. adult dose of a solution of 8 oz. copper sulphate, 2 oz. arsenious acid, and $5\frac{1}{2}$ lb. magnesium sulphate to 5 gallons of water, reported that all the worms in the fourth stomach were killed in twenty-four hours. The lamb dose of this formula, 1 oz., was regarded as rather severe, and the amount of copper sulphate was therefore reduced to 4 oz. Wood notes that the addition of sodium arsenite did not tend in any way to give better results than copper sulphate alone.

In this experiment adult sheep were given 2 grains of sodium arsenite (85 per cent. arsenious acid) and $7\frac{3}{4}$ grains of copper sulphate The lambs in accordance with their age were given $\frac{3}{4}$ grain of sodium arsenite and 3 grains of copper sulphate. In each case the drugs were administered as liquids, the results being given in Table No. 5.

TABLE No. 5.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
47	Adult	2 grains sodium arsenite and $7\frac{3}{4}$ grains copper sulphate	94
48	ditto ..	ditto	89
49	ditto ..	ditto	296
50	ditto ..	ditto	8
51	ditto ..	ditto	42
52	Lamb	$\frac{3}{4}$ grain sodium arsenite and 3 grains copper sulphate	3,266
53	ditto ..	ditto	228
54	ditto ..	ditto	331
55	ditto ..	ditto	621
56	ditto ..	ditto	924

Total worms remaining in adults, 529; average worms per adult, 106; average worms per control adult, 803; efficiency therefore 87 per cent.

Total worms remaining in lambs, 5,370; average worms per lamb, 1,074; average worms per control lamb, 3,275; efficiency therefore 67 per cent.

OBSERVATIONS.—In the case of the five adult sheep sodium arsenite and copper sulphate in a 2 and $7\frac{3}{4}$-grain dose, respectively, gave a higher and more uniform efficiency than any other anthelmintic tested, though

the margin between it and carbon tetrachloride is comparatively small. In four out of the five sheep less than 100 worms remained, in one case only 8 being collected, the efficiency throughout being noted as 87 per cent. With the lambs, however, the reduced dose removed only 67 per cent. of the nematodes, due mainly to the large number, 3,266, collected from No. 52. As the controls averaged 3,275 worms there is no indication of any efficiency at all in this case. In the other four the mixture gave an efficiency of 84 per cent. The only explanation that can be offered for No. 52, in view of the high efficiencies evidenced by the remaining animals, is that the dose could not have been swallowed and was vomited soon after administration. Unfortunately, no other lambs were available for a repeat test, but, in consideration of the results obtained otherwise, sodium arsenite and copper sulphate has given evidence of a high efficiency, but requires further investigation before any definite recommendation can be made.

EXPERIMENT No. 5.

Arsenic and Magnesium Sulphate.

Arsenic and epsom salts was one of the first anthelmintics used in Australia, and owes its prominence in Queensland to Brown. Brown has frequently written of the efficiency of this mixture, but no controlled tests have, so far as is known, ever been made of its value against *H. contortus*. Seddon and Ross used sodium arsenite in their experiments in 1927, but not arsenic and epsom salts. Carew mentions it as an efficient drench as a result of his trials in 1929, no worms alive or dead being found in the fourth stomach forty-eight hours after treatment. The arsenic is stipulated by Brown to contain not less than 95 per cent. arsenious acid. The epsom salts have probably been included in order that the purgative action may prevent much of the absorption of the arsenic, so reducing its toxicity.

The formula recommended by Brown consists of 2 oz. arsenic, containing not less than 95 per cent. arsenious acid, and 6 lb. magnesium sulphate to 5 gallons water. The adult dose is 2 fluid oz., or 2⅓ grains of arsenic and 105 grains of magnesium sulphate, the lamb dose 1 fluid oz. In Table No. 6 will be found the results of treatment with these doses.

TABLE No. 6.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
57	Adult	2⅓ grains arsenic and 105 grains magnesium sulphate	214
58	ditto ..	ditto	6
59	ditto ..	ditto	26
60	ditto ..	ditto	410
61	ditto ..	ditto	84
62	Lamb	1⅙ grains arsenic and 53 grains magnesium sulphate	452
63	ditto ..	ditto	686
64	ditto ..	ditto	746
65	ditto ..	ditto	516
66	ditto ..	ditto	613

Total worms remaining in adults, 740; average per adult, 148; average worms per control adult, 803; efficiency therefore 82 per cent.

Total worms remaining in lambs, 3,013; average per lamb, 603; average worms per control lamb, 3,275; efficiency therefore, 87 per cent.

OBSERVATIONS.—These results demonstrate that Brown's reports of the efficiency of this drench were apparently well founded, with both adults and lambs a large percentage of the worms being removed. The results are more uniform with the lambs, due most likely to a more even original infestation. The worms remaining in four of the five adult sheep denote an efficiency of 88 per cent., and from three of the four only 6, 26, and 84 *H. contortus* were collected.

EXPERIMENT No. 6.

Sodium Fluosilicate.

Sodium fluosilicate has been given recent prominence as a dust spray for insect pests, but the literature available gives no information concerning its anthelmintic properties. Rizk Attia in Egypt gives the minimum lethal dose for goats as 1·5 grams, and states that even a 1 gram dose may be followed by toxic symptoms. Ross, in the course of correspondence with the writer, notes that the toxicity of the drug is not as high as reported and states that the dose for sheep is 1 to 1·5 grams and that 3 grams may be toxic. Unfortunately only four sheep were available for testing this drug, all of which showed the typical signs of a heavy infestation. Nos. 68 and 69 were very weak and it was very doubtful whether they would survive. The dosages varied from 1 to 2 grams, the drug being administered in a hard capsule after the usual preliminary starving.

TABLE No. 7.

No. of Sheep.	Class.	Dose.	No. of *H. contortus* Remaining.
67	Adult	2 grams	Died
68	ditto ..	1·5 grams	Died
69	ditto ..	1·5 grams	220
70	ditto ..	1 gram	1,594

The animal that received two grams and No. 68 to which 1·5 grams were given died the day following treatment. Unfortunately it could not be determined to what extent the drug had aided in bringing on death. The fact that No. 69 was able to tolerate the 1·5 gram dose, even though it was very weak before treatment, indicates that the 1·5 gram dose should not affect a normal healthy animal. As only 220 worms were collected from this sheep as compared with an average of 803 from the controls, there is an indication that with this dose sodium fluosilicate possesses some degree of anthelmintic efficiency. The large number of worms remaining in No. 70 after administration of a 1 gram dose likewise suggests that this dose is too low to be of any value.

Discussion.

Summarising the results of the experiments outlined above, the efficiencies of the anthelmintics used are expressed below.

TABLE No. 8.

Drug Used.	Efficiency in Lambs.	No. of Animals Used.	Efficiency in Adults.	No. of Animals Used.
	Per cent.		Per cent.	
Carbon tetrachloride (2 c.cs.)	..	..	85	5
Carbon tetrachloride (1 c.c.)	91	5	..	..
Carbon tetrachloride (5 c.cs.)	..	..	99	3
Arsenic and magnesium sulphate ..	87	5	82	5
Copper sulphate and mustard ..	83	5	79	5
Sodium arsenite and copper sulphate	67	5	87	5
Tetrachlorethylene (5 c.cs.)	99	2	62	5
Tetrachlorethylene (2½ c.cs.)	42	3	..	..
Sodium fluosilicate (2 grams) ..	..	..	Died	1
Sodium fluosilicate (1·5 grams) ..	..	..	73	1
Sodium fluosilicate (1·5 grams) ..	..	..	Died	1
Sodium fluosilicate (1 gram)	..	..	*	1

* 1,594 *H. contortus* left; 803 in controls.

Perhaps the most outstanding finding in these experiments has been the almost total failure of tetrachlorethylene to repeat the high efficiencies obtained from it by previous workers in the doses of 5 c.cs. and 2½ c.cs. for adults and lambs respectively. In both classes of sheep, with the exception of sodium fluosilicate, this drug left the largest number of worms of the several drugs tested. No definite opinion of the anthelmintic value of sodium fluosilicate can be expressed until further experiments are carried out. In view of the high efficiencies of three of the drugs used and of the fact that sodium fluosilicate, if proven highly efficient, would most probably have to be administered as a powder, a tedious process where large numbers of sheep are concerned, it is doubtful whether additional work with this drug would be worth while. Carbon tetrachloride, copper sulphate and mustard, and arsenic and epsom salts all gave very good results. Carbon tetrachloride in 2 c.c. doses was second in efficiency in the adults, though the margin between it and sodium arsenite and copper sulphate was comparatively small. With the lambs it removed on the average 91 per cent. of the worms present and proved to be the most efficient drug tested on these animals. For reasons already outlined, although the 5 c.c. dose gave almost 100 per cent. efficacy with three adult sheep, this dose is not recommended. It is, therefore, considered that, in so far as efficiency is concerned, carbon tetrachloride in 2 c.c. and 1 c.c. doses for adults and lambs respectively was the best anthelmintic tested. Second preference may be given to arsenic and magnesium sulphate, though there is little to choose between this mixture and copper sulphate and mustard. It is felt that the results given by sodium arsenite and copper sulphate would be equal to, if not better than, those yielded by arsenic and magnesium sulphate or copper sulphate and mustard, but in view of the comparatively low efficiency exhibited by the reduced dose for lambs, it cannot, at any rate for the time being, be given any recommendation.

Taking into consideration the factor of safety, there has been a certain prejudice against the use of carbon tetrachloride, but in a 2 c.c. adult dose it is considered that this drug is equally as safe as any of the others tested. It must be borne in mind that the safety of any drug depends to a large extent on the method of administration, and the methods of many sheepmen who endeavour to race through the flock result in a certain carelessness, under which conditions even the safest drug may produce fatal results. The extensive use of carbon tetrachloride on many large properties in Queensland, without any conspicuous untoward results and its recommendation by Ross, are considered adequate guarantees that the drug is safe. In calcium deficient country, however, proper precautionary measures must be taken, and the flock should be given a calcium lick for some time prior to treatment.

Copper sulphate and mustard in the doses administered, 17·5 grains, appears reasonably safe, but it must be pointed out that in New South Wales the safe dose is placed at 14·6 grains.

With regard to ease of administration carbon tetrachloride is without doubt the easiest to handle. Compared with the preparation of arsenic and magnesium sulphate and of copper sulphate and mustard, little mixing is required for carbon tetrachloride and liquid paraffin. Against the tedious funnel method of administration carbon tetrachloride is given in a syringe holding the exact dose, and under these conditions the number of sheep treated can be almost doubled. Finally, carbon tetrachloride may be given without any previous starvation, a decided advantage when the animals are weakened by dry conditions, when the starvation required before and after treatment by the other drugs must seriously affect the flock.

Finally, considering the cost of treatment, it is noted that at Brisbane prices, to drench 1,000 adult sheep, the cost of carbon tetrachloride and liquid paraffin would be about 11s. 3d., of arsenic and epsom salts 8s., and of copper sulphate and mustard 10s. 6d. Carbon tetrachloride is therefore the most expensive of the three anthelmintics tested, but costs very little more per 1,000 sheep than copper sulphate and mustard. This slight extra cost is thought to be more than compensated for by the time saved in mixing and in administration, and by its greater efficiency.

Summary.

Under the conditions outlined above carbon tetrachloride in a 2 c.c. adult and 1 c.c. lamb dose combined with liquid paraffin to make 5 c.cs. is considered the most successful method of treatment against *H. contortus*. Arsenic and epsom salts, and copper sulphate and mustard in the doses used are also highly efficient, with little to choose between them but with the former drench perhaps the cheaper and more efficient. Tetrachlorethylene gave very disappointing results. In any case its cost as compared with that quoted for carbon tetrachloride, &c., would prohibit its use, the treatment of 1,000 sheep costing a little more than 22s. Further experiments are required with sodium arsenite and copper sulphate and with sodium fluosilicate before any definite opinion on their efficiency against *H. contortus* can be expressed.

The Efficiency of Carbon Tetrachloride, Tetrachlorethylene, &c., against Tapeworms.

As the lambs were heavily infested with the tapeworm, *Moniezia* sp., an opportunity was afforded of making some observations on the effect of the various anthelmintics used on these parasites.

The five control lambs yielded nearly fifty tapeworms between them, many of the worms being over 10 feet in length. From the presence of tapes in each one of the five controls it was assumed that each lamb of the flock was infested. Carbon tetrachloride, tetrachlorethylene, and copper sulphate and mustard appeared to have had little effect on the tapes in the lambs treated, every lamb yielding numbers of worms, many of them of fair length. From the lambs treated with arsenic and magnesium sulphate not one complete tape, i.e., a tape of any noticeable length, was obtained. Unfortunately time did not allow a more complete examination to ascertain whether or no the heads were removed along with the strobila. However, the results indicate a certain efficiency against tapeworms possessed by this arsenic mixture. With sodium arsenite and copper sulphate there was evidence of a slight efficiency only.

Acknowledgments.

Thanks are due to Mr. J. D. Allen, Spring Meadows, Dalby, for making the adult sheep available and for allowing facilities on his property for carrying out certain of the experiments; to Mr. W. F. Alexander, Pipewell, Dalby, who so kindly supplied the lambs; to Mr. C. J. Pound, late Government Bacteriologist, for permitting certain of the experiments to be carried out at Yeerongpilly; and to Mr. Robert Veitch, Chief Entomologist, without whose approval and sympathy this work could not have been undertaken.

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PACKING GRAPES FOR MARKET AT HOME AND ABROAD.

By J. H. GREGORY, Instructor in Fruit Packing.

THE grape industry of Queensland, particularly in the Stanthorpe district, is increasing in production rapidly. To meet this increase it is necessary to find new markets. Tests in cold stores have shown that the Stanthorpe grapes are eminently suited for export overseas. Successful shipments have been sent to Batavia, Singapore, Canada, and New Zealand. The success gained has only been achieved by close attention to the packing and the "get up" of the fruit. I propose, as two distinct systems of packing are used, to deal with the handling of grapes separately for the local and export markets. The same care and system of harvesting the fruit should be used either for export or local market.

Shed Equipment.

The equipment necessary in the packing shed is not of a very costly nature. One set of small platform scales, long benches for laying out the grapes ready to pack, packing stands to hold the case whilst being packed, grape trimmers, case-making bench, wiring machine, 1 large bin for holding bulk cork, kero tins cut flat for cork measuring. The benches and stands can be made at home for a small cost. Empty galvanised iron crates with the addition of legs make satisfactory benches.

Harvesting.

Fruit should be picked, as far as possible, in the cool of the day and never whilst wet from rain or dew. Pickers can, with advantage whilst picking, trim the bunches of all small, damaged, or diseased berries, care being taken to keep the fruit as cool as possible whilst handling. Large, roomy baskets make excellent picking containers. The bunches when trimmed should be carefully placed in the

PLATE 175 (Fig. 1).

Showing the method of placing all stalks up in the picking basket so that bunches can always be handled by the stalks without having to touch the fruit. This assists in preserving the natural bloom on the fruit.

picking baskets with the stems up (Fig. 1), pickers taking care to always handle the fruit by the stems and to as much as possible retain the natural bloom on the fruit. The baskets when full should be placed in a cool, shady position until ready for transport to the packing shed. On entering the packing shed the bunches

should be examined further and any damaged berries missed during previous handling carefully clipped. The fruit should then be spread out on a flat table on the cool side of the building (Fig. 2), again taking care to place them carefully with the stalks up. This assists the fruit to cool and enables the packer quickly to select any particular size or type of bunch that he may need to fill a particular portion of the layer when he is packing the fruit.

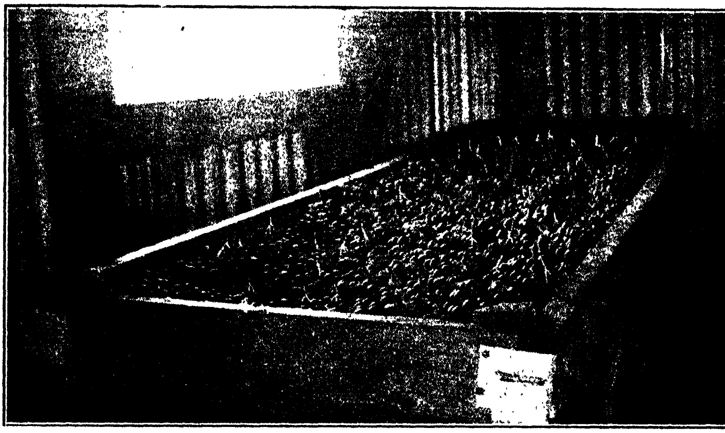

PLATE 176 (Fig. 2).
Fruit spread out on the table prior to packing. Again notice the way all stalks are placed upwards to permit easy handling of bunches.

Sweating or Wilting.

It is recommended to sweat grapes for about 24 to 48 hours before packing. This is done by storing the fruit in a cool place where the air has free circulation around it. Weather conditions have an effect on the sweating period, grapes in warm weather taking less time than in the cooler periods. After sweating the fruit becomes tougher and more pliable, enabling it to be handled with greater ease and less chance of cracking the berries or damaging the fruit at the stalk. Sweating also helps to eliminate slackness in packing which is likely to develop during transit through the shrinkage in berries which are packed without being sweated.

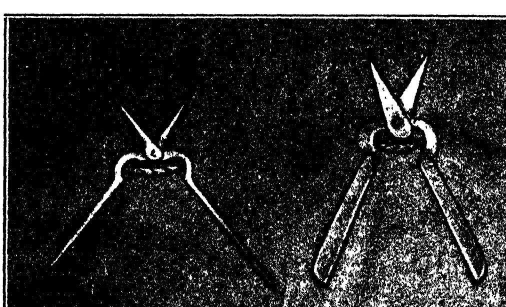

PLATE 177 (Fig. 3).
Types of grape trimming clippers.

PACKING FOR LOCAL MARKET.

Containers.

There are two types of half-bushel cases in use and a quarter-bushel case. Bushel cases are not recommended. The Dump Half-bushel, 18 inches long by 7⅛ inches wide by 8⅝ inches deep, is an excellent container, but the better container is the Half-bushel Standard Case, 18 inches long by 5¼ inches wide by 11¾ inches deep. This container when in transit has not the same weight of fruit pressing on the bottom layer as the Half-bushel Dump case, the "Standard" only having 5¼ inches of fruit as against 7⅛ inches in the "Dump." This is a factor for consideration where fruit is being sent long distances to the northern markets of the State. A quarter-bushel case is also used and is very popular on some markets. Growers are advised to consult with their distributors before adopting this package. Another popular method adopted by progressive growers is the use of cartons. (Fig. 4.) Some growers use cardboard but the best type of carton is one made of plywood. This has the advantage of not bulging at the sides when filled with fruit, as happens on occasions with cardboard, making it harder to place the containers in the boxes used for transit. The cartons can be made to a size that will hold approximately 2 or 4 lb. of fruit and will fit the ordinary cases in use. Different sizes of cartons can be used, but growers are advised to consult distributors as to the best sizes to use for their particular trade.

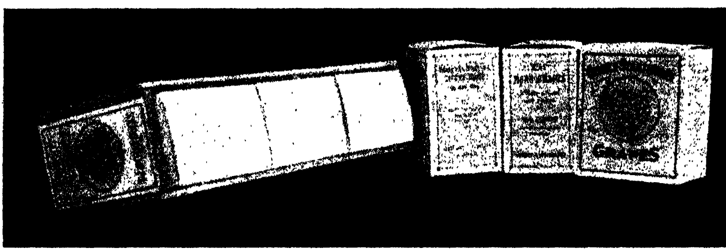

PLATE 178 (Fig. 4).
Cartons used for packing. Three of these cartons fit ¼ bushel case.

Packing.

The same system of packing is adopted in both the types of cases. Packers should endeavour as much as possible to keep all stalks to the centre of the box so that buyers can open the cases on either top, bottom, or sides and only find a surface of fruit with practically no stalks showing. (Figs. 5, 6, and 7.) This style of packing is easily done. The case should be lined with clean white or coloured paper and the fruit carefully placed in the case in layers. The first layer is started by placing the points of two bunches in the corners of one end of the box with the stalks to the centre of the layer but facing upwards and inwards. (Fig. 5.) Bunches are then placed point first into the corners made by these bunches and the side of the box until the layer is finished. The space, if any, between the two lines of grapes of the first layer is then filled by placing bunches into the space with the points to the bottom and the stalks up. This

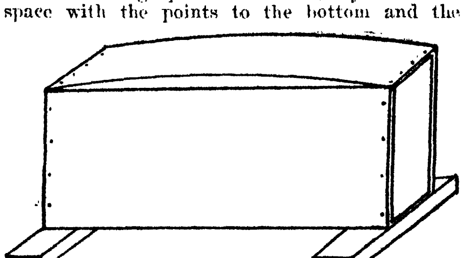

PLATE 179.
Method of placing two pieces of timber on the floor of shed. This makes a good solid nailing down bench, and permits the bottom of the case as well as the top to bulge slightly when the lid is nailed on.

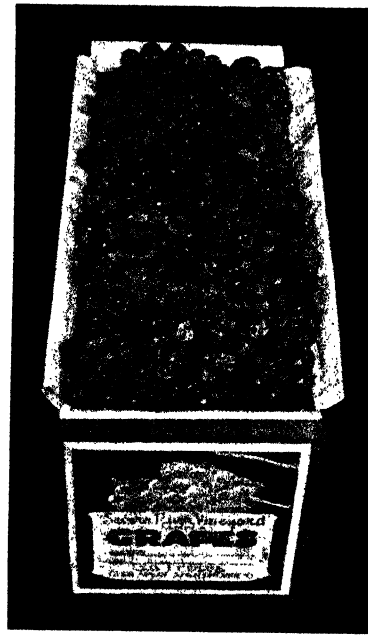

PLATE 180.

FIG. 5.

Method of placing the first layer. Note how all stalks are placed inwards and upwards so that only fruit will show if the bottom board of the packed case is removed.

FIG. 6.

Finished case before nailing down. Note how all stalks are carefully hidden. If care is taken, all sides of the case will open up showing fruit only.

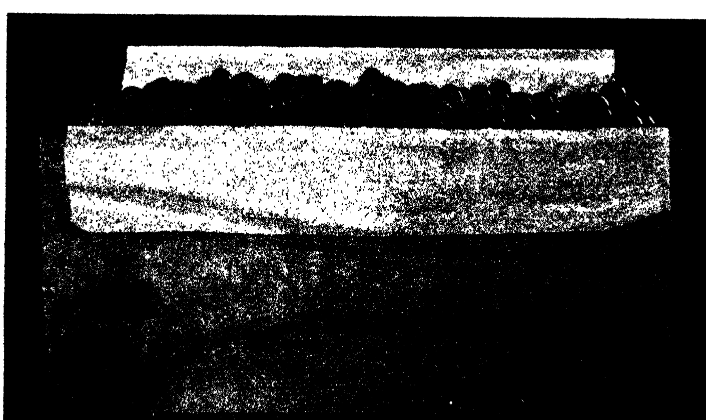

PLATE 181 (Fig. 7).
Side view of case before being nailed down. Note the height of the fruit in the case.

presents a level surface of fruit free from stalks to the bottom of the case. The process is carried on until with the Dump Case the case is half filled, when the fruit is shaken into position by light bumping. Battens should be placed beneath the ends of the case whilst this operation is being performed. The Standard case should have the fruit eased into position when about one-third full and again when about three-quarters full. The case is finally finished by packing the fruit in layer by layer, bringing the fruit to a height of 1 to 1½ inches (Fig. 7) above the top of the case. Battens are then placed under the ends of the case, the paper folded over, the lid held in position with a gentle pressure placed on the fruit, and the case be packed in the case. This is an advantage from the buyer's point of view. It sufficient care is taken in this operation the bunches will not be injured in any way. After casing the fruit into position and before finally nailing down, the lid should be removed and the top of the case inspected. If by mischance any grapes are cracked these should be carefully clipped and removed. The whole success of grape packing is having the fruit tight in the case to prevent movement whilst in transit. Movement in the finished case causes damaged and wet fruit, making consignments wasty and unsaleable.

Packing for Export.

Where grapes are intended to be stored for lengthy periods or transported over long distances in refrigeration, two methods of packing are used, these being granulated cork and sulphite paper and woodwool.

The most favoured method commercially is the use of granulated cork as the packing medium. This method of packing has the advantage over the sulphite tissue paper and woodwool, in the fact that a much larger quantity of fruit can be packed in the case. This is an advantage from the buyer's point of view. It also means that the grower does not need such a large number of cases to harvest his crop, greatly reducing his outlay for timber handling and cartage. Shipping freights, which are based on the cubic space occupied, are reduced, as a greater quantity of fruit is contained in a given space. It must be remembered that overseas buyers buy the fruit on the basis of the weight contained in the case.

In some countries barrels are used instead of cases and sawdust in place of granulated cork. It is necessary that the sawdust be absolutely clean and free from taint.

All varieties of grapes grown in Queensland are not suited for export, the number of suitable varieties being very small. The best varieties of white grapes in their order of merit are the Ohanez, Waltham Cross, and Cervant; black grapes, Purple Cornilhon, Black Malaga, and Black Muscat; red grapes, Red Malaga and Flame Tokay. This opinion is based on the results of export consignments to the East, New Zealand, and Canada, and experimental packages stored in Brisbane.

After analysing the results of these consignments the length of time the various varieties should be able to be stored with safety would be—Black Muscats, four to five weeks; Waltham Cross, five to six weeks; Ohanez, Purple Cornichon, Flame Tokay, Red Malaga, Black Malaga, and Cervant, seven to eight weeks.

It must be stressed that this could only be achieved by every attention to careful handling.

Selection of Fruit.

Careful selection of bunches also plays an important part in successful exporting. Large loose types of bunches should always be selected. Tight bunches are unsatisfactory, being harder to trim and clean, berries in many cases being damaged whilst trimming is being carried out. Often the large, tight bunches contain many blemished berries in the centre of the bunch which can only be satisfactorily removed by cutting the bunches into sections. This is undesirable as the value of the fruit is depreciated by reducing the size of the bunches. Bunches should be selected containing only large even fruit the "hen and chickens" type of bunch being unsuitable. Bunches consisting of small fruit are of low commercial value and have no chance of returning to the grower sufficient to pay marketing and transport expenses over a long distance. It is advisable to leave a length of the stalk attached to the bunch when picking. This assists the packer when handling the fruit. Bunches with long stalks appear to carry and open in better condition than when clipped short.

Containers.

The container used, when packing with cork, is the three-quarter bushel with a centre partition. The dimensions of this case clear of the partition when made on the flat are:—24 inches long by 11¾ inches wide by 6 inches deep. Packing

can be done from the side with the case made on the flat or, as some packers prefer, the case can be made the upright way 24 inches long by 6 inches wide by 11¾ inches deep.

Both ways have been tried and proved satisfactory, the advantage of the wide way allowing more room for working. Bunches being placed in the bottom of a case made the narrow way have a much greater chance of being damaged whilst being placed in position through rubbing against the side of the box owing to the working space being so confined.

This case is quite satisfactory for the sulphite paper and woodwool packing. A smaller case is not recommended commercially, although satisfactory results were obtained with the standard half bushel case 18 inches long by 11½ inches wide by 5¼ inches deep.

Lining Paper.

Lining paper is used with all the different packs. Plain white or coloured paper cut to the correct size to fit the case should be used. For the ¾ bushel paper 12 inches by 20 inches wide is suitable and leaves a good margin for overlapping, two pieces being used for each compartment of the case. Care should be taken to see that the paper is placed in the case neatly as damaged or torn lining paper creates a bad first impression when fruit is being examined.

Granulated Cork Filler.

The cork comes packed in bales ready for use, but pressed into a tight mass. This can easily be broken up by the use of an old chisel used with a stabbing motion. The bulk cork should be placed in a bin, as if left open the wind will soon blow it about the packing shed, causing waste and extra work and loss of time in clearing up.

A kerosene tin cut on the flat is a good cork measure for the packer to use, permitting the packer to see the amount of granulated cork he is using. The average case of fruit takes approximately 1¾ kerosene tins of cork to the case. This will vary slightly whether the cork is fine or coarse, or the bunches tight or loose.

No weight of cork can be given to use to the case as the different types of cork vary in weight, some being 4½ lb. to the kerosene tin, whilst some cork weighs as low as 2½ lb. to the kerosene tin.

The cork should not be too coarse as it will not penetrate the bunches. Care should also be taken to see that the cork is not too finely granulated, as cork of this description adheres strongly to the fruit after storage, spoiling the selling value. It should be remembered that after travelling long distances and being stored a long time bunches cannot be shaken too roughly to dislodge cork, as the berries are not as tight on the stalk then as when picked. This shows the necessity of the cork being free from dust and not ground too finely.

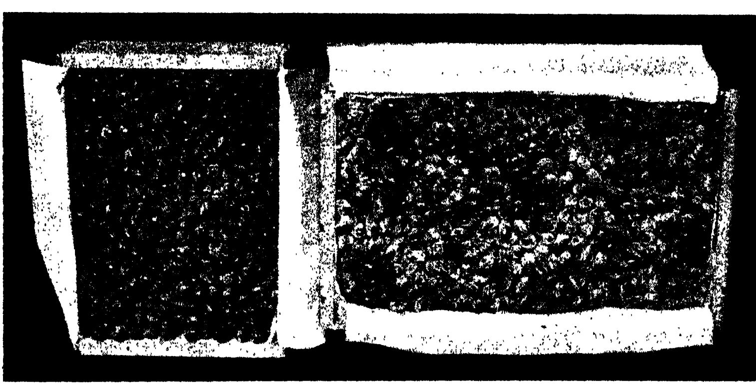

PLATE 182 (Fig. 8).
Standard ½-bushel and ¾-bushel case opened on the side showing the absence of stalks when the fruit is packed correctly.

Packing.

When packing on the flat, the case is first lined with paper, and a layer of cork about ¼ inch in depth is spread on the bottom of the case. The trimmed bunches are then placed in a layer upon the cork. This layer when completed has a layer of cork sprinkled upon it, and the process is repeated until the case is filled (Fig. 9) to ½ inch above the top. The fruit and cork is then gently shaken into position by placing the lid over the fruit and gently knocking each end upon the bench. If this operation is carefully carried out no damage to the berries will result. If any berries happen to become damaged they should be carefully clipped off and removed.

A layer of cork is then spread on the fruit (Fig. 10) and the lid applied.

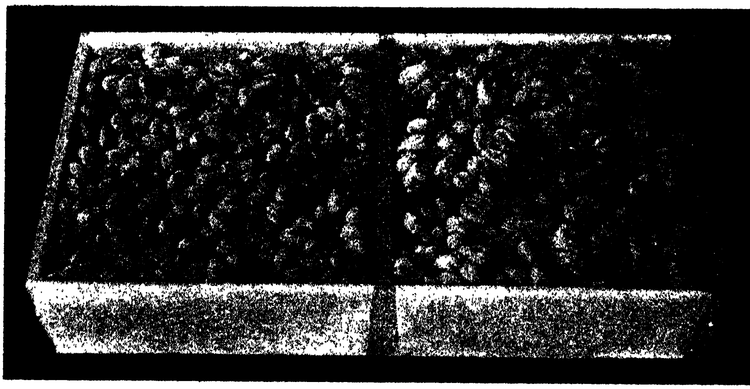

PLATE 183 (Fig. 9).
Case packed for export in granulated cork. Before nailing down the fruit is covered with a final layer of cork.

If packing the narrow way, a depth of about ½ inch of cork should be spread on the bottom, then a layer of fruit, which is covered with cork, taking care to see that the cork runs between the fruit and the side of the case. This process is repeated layer by layer until the case is full. Whilst packing, the fruit and cork should be gently shaken in position when the case is about one-third full, and again when about 3 inches from the top. The case should be filled to ½ to 1 inch above

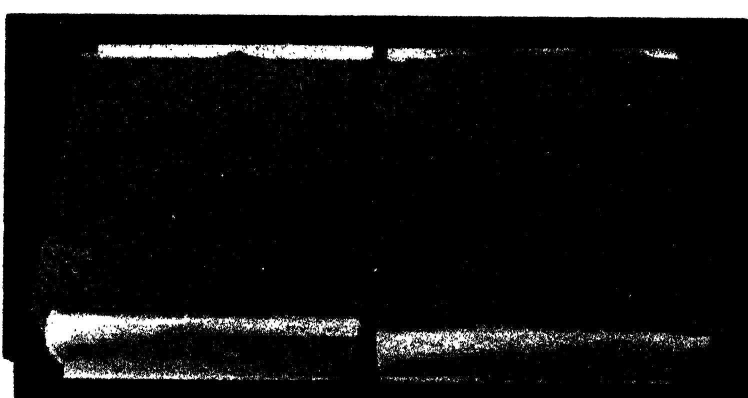

PLATE 184 (Fig. 10).
The same case as in Fig. 9 with the final layer of cork applied. This case is now ready to nail down.

the top. The fruit should then be shaken into position by using the lid in the same manner as in the other packs. Granulated cork should be used to level the top off before finally nailing the lid in position.

Packing in woodwool and sulphite paper should present no difficulties. The case is first lined with paper, and then a pad of woodwool is placed on the bottom and around the sides of the box. The clipped bunches are then carefully wrapped in the sulphite paper and placed closely together in the box. Only large-sized bunches should be used. Where bunches are small, two at a time can be placed in the one sheet of paper. This is preferable to wrapping small bunches separately. The packer should aim at having one layer of fruit in the case. From this it will be seen that only large bunches will adapt themselves satisfactorily to this pack. When the box is filled any spaces between the bunches are carefully padded with woodwool (Fig. 11). A layer of woodwool is then placed on the top of the fruit, and the lid placed in position. The sulphite paper should be cut at least 15 inches by 15 inches in size.

Special points to remember when doing this pack are—

Tease the woodwool into a soft pad.

Keep the bunches tightly packed and well padded so that there is no movement in the fruit after the lid is applied.

Close attention to the following points when packing grapes will assist greatly in obtaining satisfactory results:—

1. Clip bunches of all blemished, diseased, and small berries. Remember the export trade only wants very high-class fruit.
2. Always remove damaged or diseased berries by clipping. Pulling often causes moisture with its high percentage of waste.
3. Do not pick grapes after heavy dews or rain, but wait until the fruit has dried. Bunches do not readily dry after removing from the vine. Moisture is fatal to the successful carriage of grapes.
4. Avoid cutting up bunches as much as possible; small bunches or sprigs of berries spoil the sale of high-class grapes.
5. Sweat in a cool, dry place.
6. Do not pack fruit whilst hot, but allow all fruit to thoroughly cool before packing.
7. Handle fruit by the stalks only. This helps to preserve the bloom on the grapes, helping them to keep a fresh appearance even after a long period of storage.
8. See that all boards fit closely together when making up cases.

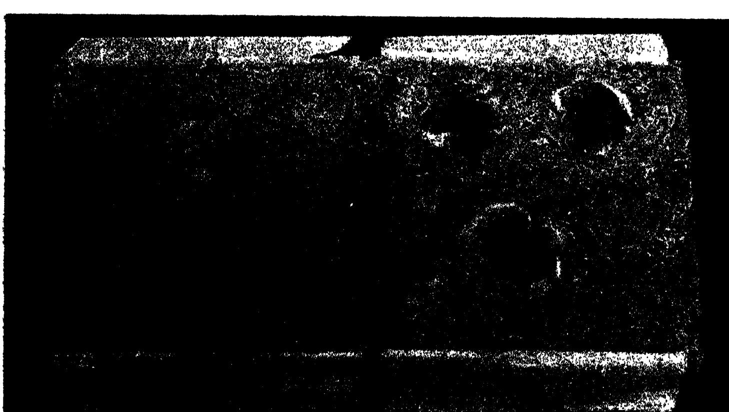

PLATE 185 (Fig. 11).

Fruit packed for export using the sulphite paper and woodwool method of packing. The paper on three of the wrapped bunches is torn, showing the fruit.

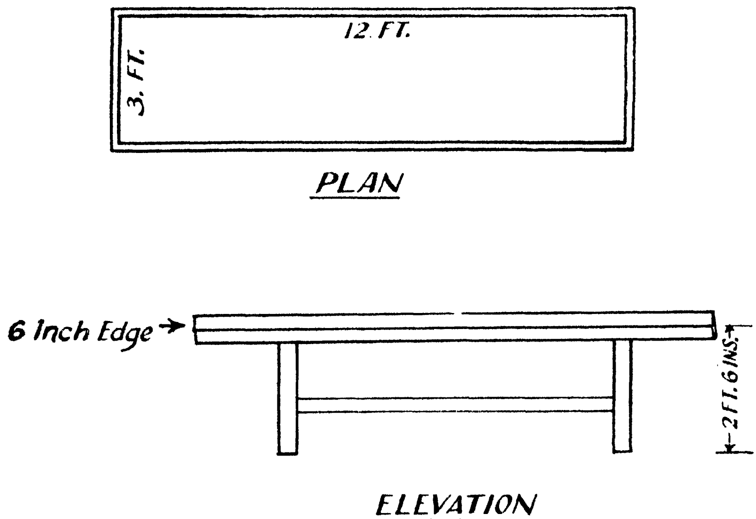

PLATE 186 (Fig. 12).
Table to hold fruit whilst packing.

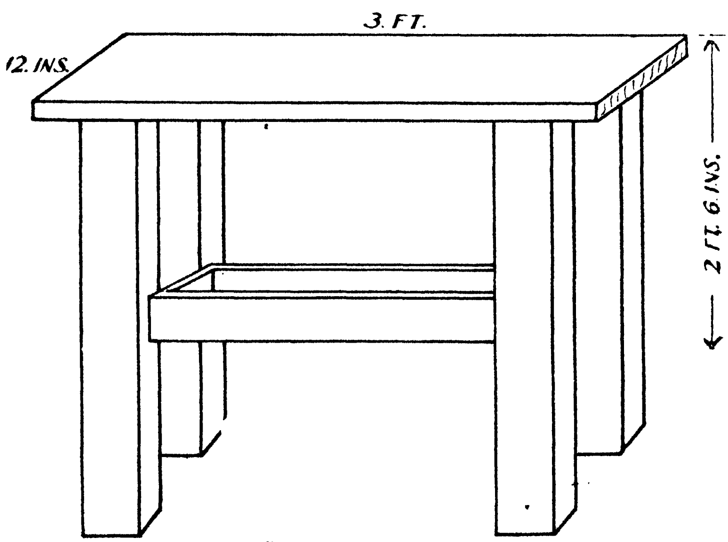

PLATE 187 (Fig. 13).
PACKING STAND.
This stand will hold one export case and the kerosene tin cork container whilst packing.

Labelling.

The use of a fancy label is of great assistance from the display and advertising point of view. Labels should be made bright and attractive, and contain in the design spaces to permit the printing of all particulars such as the weight and variety of grapes. The label to be complete should have embodied in the design the grower's name and address, the address having to contain the word "Australia" in plain letters to be suitable under the Commerce Act for export. A label 11 inches by 5½ inches will fit the end of the export case or standard half-bushel. The dump half-bushel label will measure a maximum size of 8 inches by 7 inches.

Stencils.

Stencils must also conform to the Commonwealth regulations and Queensland Fruit and Vegetables Act by having the full name and address of packer, and where used for export the word "Australia." Cases must also be branded with the name of the fruit and the weight contained in the case.

Wiring.

Wiring the cases when exporting or sending long distances is a necessity. The wires should be placed around the case ⅛ inch from the inside edge of the ends. Two wires should be used, one at each end in preference to one around the middle of the box. Care should be taken to see that they are placed around the case parallel to the end of the box towards the middle about ⅛ to ¼ inch from the inside edge of the end boards.

This is essential if the wiring is to give the best results. Often when packing for local markets two small boxes can be wired together to advantage.

Transport.

It is necessary to follow up good harvesting and packing operations by careful handling whilst the fruit is in transit to the rail or boat. The fruit should not be left where it can become wet. Carters should not walk on or sit upon packed cases. It is only by the close attention to all these details that the perfect product can be delivered to the world's markets in a condition that is good enough for the buyer to pay enough to give the grower a satisfactory return for his labour.

Acknowledgment.

Thanks are due to Messrs. J. Ferris and J. Winkler, of Glen Aplin, and R. Perkins, of Ballandean, for making available the fruit which was used for taking the illustrations.

BACON FOR EXPORT.

"After seeing what has been achieved in other lands, we in Australia should pause and consider the advisability of having a stocktaking of our methods, with the object of making a sincere effort to produce a suitable bacon for export at a selling price not above world parity," writes Mr. J. T. Madden, of Casino.

"Australia is at a disadvantage in competing in the British market owing to its geographical position," he continues. "The possibility of securing an oversea trade of mild-cured bacon hinges on the result of research that is now being conducted with the object of overcoming the difficulty of transport through the tropics. Mild-cured bacon cannot satisfactorily be transported over long distances, as so far no simple way has been found of preventing the fat turning rancid after about six to eight weeks' storage. The alternative is to make bacon from frozen pork, and scientific experiments in progress at the Low Temperature Research Station at Cambridge under the Department of Scientific and Industrial Research have lately proved that frozen pork that has been stored for a longer period than would be necessary to send it to Great Britain from Australia can still be made into very good bacon.

"The bacon produced is as good as Dutch and very little inferior to Danish."

Mr. Madden directs attention to the fact that in 1929-1930 production of pig products was short of State requirements. "If the official year book figures can be taken as correct," says Mr. Madden, "there appears to be ample scope for increased production in New South Wales to supply our own requirements."

WILD LUCERNE.

(*Stylosanthes mucronata*).

G. B. BROOKS, Director of Agriculture.

IN view of the numerous inquiries being made regarding this interesting leguminous plant, the following notes appertaining to its distribution and habit of growth may be of interest.

Stylosanthes mucronata (Wild Lucerne), a native of tropical America, appeared in the Townsville district many years ago, the writer noting it on the outskirts of the city as far back as 1912. It is now widely distributed along the coastal areas, being in evidence from Cooktown to St. Lawrence.

When grown under favourable conditions, it has a close resemblance to ordinary lucerne. In habit of growth, however, it is more recumbent and spreading, forming a dense green mat when closely grazed down.

A Summer Annual.

Stylosanthes is a summer-growing annual, appearing in early spring and lasting well into the winter. This is a feature of considerable importance as, unlike most winter-growing legumes, its appearance every season is assured. From observations made in the Mackay district it would appear that its period of seeding is during late summer. This late-maturing habit may, in all probability, be a handicap to its self-propagation in the more temperate districts owing to the season being too short for seed production.

The angular-shaped seed is smaller than that of ordinary lucerne and has a tough bristle attachment about ⅜ inch in length with a characteristic hook at the end. These hooks project from a fan-shaped container, a unique proviso for distribution in that they readily attach themselves to the hairs on the legs of stock, &c. It is likely, however, that the main source of distribution is through stock grazing on the plant when it is in the seeding stage, a heavy germination usually eventuating from the manure

Its first appearance in a district is invariably in a railway station yard as a result of stock having fed on the plant prior to trucking and the dung getting kicked out during train delays and shunting. Straying stock grazing in the yard then distribute the plant along the roads.

Wild lucerne prefers a soil with a firm bottom for its establishment, and rarely shows up in deep loams where vegetation such as tall grass is in evidence. Those who desire to give this useful pasture plant a try-out will therefore obtain best results by sowing on a comparatively hard seed-bed and mulching with a little farmyard manure.

The Departmental stocks of seed are exhausted, but supplies may be obtained from Mr. F. G. Harris, care of Michelmore and Company, Proprietary, Limited, Post Office Box 37, Mackay.

Feeding Value.

In regard to the feeding qualities of Wild Lucerne, the following analyses show that it compares very favourably with the ordinary variety:—

ANALYSES OF WATER-FREE MATERIAL.

—	Cairns, 1929.	Townsville 1928.	Townsville, 1917.	Townsville, 1914.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Protein	12·4	14·6	12·3	17·7
Carbohydrates	57·9	49·7	45·6	41·0
Fat	1·1	2·5	0·7	1·2
Fibre	25·5	26·3	36·2	31·9
Ash	13·1	6·9	5·2	8·2
Lime	1·852	..	..	1·6
Phosphoric Acid	0·201	..	..	0·507

DISEASES OF THE PIG.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

EXTERNAL PARASITES OF THE PIG.

Blowflies.

The ordinary blowfly, also referred to as the Sheep Blowfly, is a source of considerable annoyance to livestock in this country, the damage and irritation resultant from infestation by the larvæ (maggots) of this fly being of considerable economic importance, though, as far as the pig raiser is concerned, the loss should be reduced to nil, provided the stock are carefully handled and given regular attention.

In the pig, infestation by fly maggots follows the attack of the insect upon wounds following the operation of castration or other operations, and from accidental causes. The fly deposits the living larvæ upon the wounds, and in burrowing into the tissues they immediately set up irritation, followed by pus formation. Unless the animal is given immediate attention, this irritation may result in complications such as will seriously reduce the commercial value. Treatment must, therefore, be largely preventive or such as would prove successful in dealing with wounds of any description.

Prevention and Treatment.

Preventive measures consist in efficient treatment of these open wounds, especially when they are noticed after pigs (boars in particular) have been fighting. The following healing ointments are recommended:—

Antiseptic Oils.—This recipe is specially advised for farm and homestead use for application to open wounds, sores, &c. It is made up by dissolving 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When quite clear, add to it 1 pint of olive oil. Shake well, bottle, and label.

Another prescription suitable for use on aged pigs in which the wounds are large and the healing process more lengthy combines the active ingredients of the above with a more tenacious and adherent basis. Olive oil is replaced by stockholm tar. The formula in this case will be: Dissolve 1 ounce of iodoform in 14 fluid ounces of eucalyptus oil. When dissolved and quite clear, add 1 pint of stockholm tar. Shake well, bottle, and label distinctly as required.

These antiseptic oils are to be preferred from a humane and health standpoint, and as they stimulate natural healing processes, repel flies, and are to be recommended in preference to kerosene and fat or other local bush remedies, reliable as these may have appeared to be in days gone by.

Other Parasites.

Infestation by flies, fleas, mosquitoes, sandflies, bush ticks, &c., varies in its intensity in accordance with the care and attention given to pigs and by the environment in which they are kept. Stock kept on low-lying swampy areas are always liable to infestation by parasites such as mosquitoes. Pigs kept in paddocks in which there is an abundant growth of blady or bush grass are liable to bush tick infestation, while pig paddocks and yards on dry sandy ridges are more liable to infestation by fleas, sandflies, and mosquitoes than by ticks.

Prevention and Treatment.

Irritation caused by these parasites can, to a large extent, be prevented or reduced if ample supplies of disinfectant solution are available and are sprayed regularly over the sty walls and round the food troughs, water-pools, and wallows, and if the pens are kept clean and free from dust, mud, and rubbish, and if dung and urine-soaked bedding are regularly cleaned away and buried or ploughed in. Dung heaps are hotbeds for the breeding of parasites, and should not be permitted to accumulate. Plough all this matter in and the crops will benefit.

Where pigs and especially young stock do suffer as a result of infestation, it is wise to treat them, and thus prevent check in growth or development of other skin diseases following on abrasions by rubbing against posts, rails, &c.

An efficient and cheap skin dressing may be made up of buttermilk or skim milk and flowers of sulphur; this will tend to soften the skin and put it into good condition. Repeated washings with lukewarm water and the application of coconut and antiseptic oils or petroleum jelly will do an immense amount of good even if the animals are not heavily infested with parasites.

Control of Insect Pests.

The following formulæ for controlling insect pests in piggeries have been recommended by the Chief Entomologist, Mr. R. Veitch, Department of Agriculture and Stock, Brisbane:—

Flies.—Kerosene extract of pyrethrum will be found very efficient when used as a thin mist spray. This spray is made by soaking ½ lb. of fresh pyrethrum in 1 gallon of kerosene for two days in a covered vessel. The clear fluid is then decanted and used in the spray pump.

Fleas.—Kerosene emulsion: Dissolve 2 ounces of washing soap in 1 quart of boiling water. Remove from fire and gradually stir in 2½ pints of kerosene. The result should be a milky mass from which the oil does not separate. Water is then added to make 5 gallons.

Trypan Blue—A Specific for Bush Tick Paralysis.

Where scrub or bush ticks are suspected as being responsible for paralysis in pigs, it is recommended, particularly in the case of valuable animals and where scrub ticks are prevalent, that the animals should be thoroughly examined every second or third day, as it has been stated that these ticks do not harm the animals during the first four days of attachment.

It has been proved that trypan blue, injected under the skin, is a specific (or a suitable remedy) for this disease in the pig, for under careful treatment the paralysis soon improves and in a few days the animal thoroughly recovers; one dose of the trypan blue usually being sufficient.

Preparation of Solution.

A 2 per cent. solution (about 9 grains to the fluid ounce) is made by dissolving the trypan blue in boiling water, a sediment falling as the solution cools, and this should be removed by filtering through a funnel in which a properly folded filter paper is placed, or a fine piece of clean linen which has previously been boiled. The hypodermic syringe and needle, necessary in this form of treatment, before being used should be placed in a vessel containing cold water, then placed over the fire and the water boiled for ten minutes; this to thoroughly sterilize the syringe and needle, which is now ready for use when the solution to be injected has cooled.

The injection can be made anywhere under the skin, but the best positions are either in the front of the chest or behind the shoulder, the skin in these positions being loose, a fold of which is easily caught up. It is advisable to clip off the hair and disinfect the spot chosen before introducing the needle.

A dose for dogs, according to age and size, varies from 1 to 5 drachms, or 1 to 5 teaspoonfuls; the dose for calves, foals, and pigs, according to age and size, from ½ ounce to 2½ ounces, or 1 to 5 tablespoonfuls.

In general, it would be preferable for the pig raiser to have the solution prepared by a chemist to ensure accuracy of preparation and dosage.

Itching of the Skin.

Technically, itching of the skin is known as "pruritis." Pigs that are infested with external or internal parasites always appear to suffer from itching of the skin. Lice, ringworm, fleas, mange, ticks, mosquitoes, nettlerash, sunburn, sunscald, each give rise to this condition, and they are all a source of annoyance to stock that are neglected and have not the benefit of a comfortable, warm, dry shed in which to rest or sleep. In all these cases, careful observation will enable the farmer to gain some idea of the actual cause of the trouble and suggest suitable methods of treatment.

OTHER PESTS.

In addition to the internal and external parasites of the pig referred to, several other parasites are of importance, and these might be briefly referred to as parasites infesting preserved meats. They are of greater interest to manufacturers, wholesalers, and retailers than to producers, but are, nevertheless, of interest.

THE BACON FLY (*Piophila Casei*).—A cosmopolitan pest, and is better known to the manufacturer and retailer in the larval form—the larvæ being commonly known as jumpers. Besides bacon, the fly will readily breed in cheese, dried fish, and even in carrion. At times it has caused severe loss to bacon factories, but may be successfully combated by screening and maintaining highly sanitary conditions.

THE BACON WEEVIL (*Dermestes lardarius* and *Dermestes vulpinus* are not thought to cause very much loss in stored bacon, though their presence has been frequently reported. Their hairy larvæ are also to be found attacking skins and similar stored products.

FLIES, MOSQUITOES, FLEAS, AND LICE.

In common with other animals, pigs are often tormented by house flies, sand flies, and mosquitoes to such an extent that they can have no peace, and instead of lying down comfortably, as they should, they roam restlessly about all day long, and where fleas and lice also are present they spend very restless nights.

These troubles can, to a very large extent, be prevented by giving the pigs a daily dressing (only a very small quantity at each application) of oil to which a little kerosene is added. This will not only help keep external parasites at bay, but will also act as an antidote to actual irritation and bites. The pig has a tough skin and often carries a coarse coat of hair, but for all that his health may be prejudiced by parasitic infestation both external and internal. Where the skin is lacerated or badly sunburnt and cracked, blowflies and house flies swarm around and may be a source of danger to the animal. Wounds resultant from castration and other operations are favourable seats of attack by blowflies, and such wounds should be carefully watched and treated as required.

Some authorities advocate painting affected areas with a dilute solution of iodine, while zinc ointment or carbolised ointment are excellent dressings once the wounds have been thoroughly cleansed by washing or syringing out. Anything that can be done to reduce irritation and inflammation and assist healing will prove beneficial.

Prevention of attack is difficult, but something might also be attempted along these lines by getting rid of breeding grounds like manure heaps, where flies breed freely. Swampy areas are breeding places for mosquitoes and sand flies; and neglected accommodation and rubbish lying about harbours fleas and lice. A general spring cleaning is well worth while.

SUITABLE PIG FOODS.

Lucerne, either for grazing or for cutting and feeding in the sty, is the best green feed for the boar, sows, and young pigs. Wheat, oats, rye, and broadcast maize are also very suitable as green feeds for grazing; climbing varieties of cowpeas can be sown among the maize.

Sorghum should be fed only when mature. Rape is a fine winter crop, ranking next to lucerne for grazing purposes. Jerusalem artichokes are very hardy, and grow well in light soils. The pigs should be turned in to harvest these after the plants have flowered. Sweetpotatoes, suitable for warm districts of good rainfall, are good for pigs when fed with a small percentage of maize or other grains, and skim-milk; they are utilised in the same manner as artichokes for grazing.

Sugar beet and mangolds are excellent feed fed raw, and can be readily stored in a pit. Potatoes should be boiled and fed with skim-milk or maize; the water in which the potatoes have been boiled should not be given to the pigs. Pumpkins can be largely grown; they should be fed raw. Wheat and barley should be crushed and steamed for a few hours and fed with skim-milk or whey.

With regard to mill refuse (pollard, bran, and sweepings), the market value of these determines whether it pays to feed on them or not, but a very little pollard mixed in milk keeps pigs growing and fattening well. Bran, which is properly rather a laxative than a pig food, is very useful for brood sows. Sweepings from mills, &c., should be used carefully, as they often contain a lot of rubbish. It is wise to soak the sweepings, so that any nails, nuts off bolts, or similar dangerous foreign objects may sink and be separated.

Skim-milk, butter-milk, and whey are widely used as food for pigs. Skim-milk, which should be fed with crushed grains or pollard, is a good flesh-producing food. It should not be used straight from the separator, but allowed to stand an hour or so, so that the gas may work out of it. When feeding butter-milk, always add pollard or crushed wheat, barley, or maize; otherwise the pigs will be soft and blubbery when dressed. Whey also should only be fed when mixed with crushed grains.

To avoid any chance of tuberculosis, all milk products should be boiled before being fed to pigs.

THE GRAZING SELECTION.

POINTS IN SMALL FLOCK MANAGEMENT.

J. L. HODGE, Instructor, Sheep and Wool.

A GOOD start on the selection with sheep is infinitely to be preferred to a bad one, and the first move to achieve this is in the selection of the right type of ewe. No matter what preference the individual may have for a certain type of sheep, it is essential to success that he select a type suitable to the particular class of country he holds, the rainfall, the chances of hardship, and so on. To put the matter simply, that type of merino which may do splendidly in one district may be a total failure in another area. Generally speaking, the type selected should be of strong constitution without being so robust in the wool as to lose sight of quality. The rams to mate with these ewes is a most important question. In the vast number of cases the rams should be more or less close to the type of ewe grazed, and slightly stronger in the wool fibre. A strong contrast in the type of merino ewe and ram is not to be desired or encouraged. Too violent a contrast in breeding throws all ways.

CULLING.

Having firmly fixed in mind the type likely to do best and be most profitable *per head* in a particular district, it is necessary to establish this type, and the simplest and quickest method is by culling the ewes. Throw out of the flock any ewe which does not conform to the type already decided upon. Want of constitution, want of size, malformation, broadness in the wool fibre, possibly ultra fineness in the wool fibre, all constitute a reason for rejection. It is generally advisable for the selector to breed his own ewes, and with this object in view, the young ewes also should be gone through for culls at a time when they are showing sufficient length of fleece to make culling possible.

THE BLOW FLY JETTING.

The care of the flock is of the utmost importance and one of the pests most likely to be met with practically anywhere in Queensland where sheep are depastured is the attack of the blowfly. Very grave losses will occur unless an infestation is early detected and treated. If the attack is a bad one the best method to date takes the form of jetting. The formulæ used is arsenic, 7 lb.; washing soda, 5 to 7 lb.; and, if desired, 1 lb. of soft soap to the 100 gallons of water. The pressure used to get the ingredient on to the skin varies according to the length of the wool. From 120 lb. to the square inch up to 160 lb. should prove effective in most cases. I favour drafting off the sheep attacked by the fly and making up a hospital flock. These may then be observed daily and treated as required. Taking the blown sheep out of the flock also lessens the likelihood of attack to those sheep unaffected. In the case of ewes due to lamb I am not adverse to crutching.

INTERNAL PARASITES.

More likely during some portion of the year worms will make their presence felt in the flocks. This may easily be detected by unaccountable loss in condition, a generally unthrifty appearance, the humpty back, white skin, and a debilitated and anæmic condition generally.

The remedy is in drenching either with arsenic and Epsom salts, arsenic and bluestone, or bluestone and mustard. Particulars of all these remedies may be had on application to the Department of Agriculture and Stock. They are as follows:—

No. 1—

2 oz. arsenic.
6 lb. Epsom salts.
5 gal. water.

Doses—

Full grown sheep, 2 fluid oz.
Eight months to 15 months old, 1½ fluid oz.
Under 8 months old, 1 fluid oz.

No. 2—

2 oz. arsenic.
4 oz. bluestone
6 lb. Epsom salts.
5 gal. water.

Doses—

Full grown sheep, 2 fluid oz.
Eight months to 15 months old, 1½ fluid oz.
Under 8 months old, 1 fluid oz.

No. 3—

1 lb. fresh mustard.
1 lb. bluestone.
10 gal. water.

Doses—

Full grown sheep, 4 fluid oz.
Weaners, 12 months old, 3 fluid oz.
Lambs, 8 months old, 2 fluid oz.

External parasites consist of lice in sheep and ticks. The remedy is in dipping, and this operation should take place within one month or thereabouts after shearing. Care should be exercised in the choice of the material used for dipping, and the directions as to mixing followed exactly.

Lamb marking is an annual occurrence where breeding is gone in for, and should be done in an expert and cleanly manner.

All knives and instruments used in the operation should be thoroughly disinfected before using, and a vessel of disinfectant placed handy to the operator so that he may frequently use the disinfectant during the proceedings. Old dirty yards should be avoided, and when practicable hurdle yards erected in the paddock where the lambs and ewes are to be let go.

A preparation, both disinfectant and curative, should be applied to all lambs operated upon. Careful watch for the attacks of blowflies should be kept, and all lambs struck should be immediately dressed.

USE OF LICKS.

During the year it may be found that for no apparent reason, apart altogether from a worm infestation, the sheep are not doing as well as they should. This state of affairs is likely to occur when the feed is going off and the protein content of the grasses consumed is low. A sheep lick is indicated, and the ingredients given should be those to replace deficiencies in the pasture. As this subject is not a simple one it is advisable for those interested to state their particular case and circumstances to the Department. A prescribed lick for a certain set of circumstances is infinitely to be preferred to a lick which, apart from being costly, may be quite unsuited to the occasion.

CONSERVATION OF FODDER.

To my mind the time has long since arrived when consideration should be given to this most important question. Periods of drought may always be looked for, and it is economically wrong that losses should occur with such persistence.

Provision should be made in times of plenty and the fodder conserved for use in time of drought. On many sheep areas the country lends itself to the harvesting of bush hay. A quantity should be harvested each year when possible, and stored away from the ravages of the weather.

When financial circumstances permit it is advisable and economically sound to purchase well baled lucerne hay and maize grain at a price sufficiently low to merit the expenditure for the purpose indicated.

A careful perusal of the market reports over a period of years has convinced me that it is a justifiable business venture to purchase sheep feed for the purpose of conservation during flush years.

Certain properties may be so situated and served climatically that the owners could grow their own feed for winter feeding and for use in time of drought. This is to be encouraged from every point of view.

Lucerne hay has been as low in price as 50s. per ton, and maize has frequently in years past been at 2s. 3d. per bushel and under. At these prices, plus railage, both commodities would pay if used for the prevention of loss in the flocks in time of drought. The expenditure may be looked upon as a reserve or a form of insurance against loss.

SHEARING.

Shearing is harvest time for the woolgrower. Every care should be taken to remove the fleece with the smallest possible knocking about of the sheep. Apart from the actual shearing, there are other methods by which sheep are often treated roughly. Legging is to be discouraged. The shoots should not be too steep, and the sheep should be released down the shoot as gently as possible. All cuts should be dressed with an antiseptic and curative preparation. Sheep should not be too long in the sheds, and shorn sheep should be removed to their paddocks with as little delay as possible.

CLASSING THE CLIP.

As shearing time is harvest time for the selector, methods of achieveing the best possible financial results must be employed. Too much stress cannot be laid on the importance of correct classing. It is the duty of the classer to get up the clip honestly and in such a manner as best to display same to the buyer. I think the greatest mistake made at present is to be found in careless and too heavy skirting. Every fleece should be treated on its merits, and a reason forthcoming for whatever portion is skirted off. Too often wool rolling is undertaken by unskilled hands who treat every fleece in the same manner—*an* evident mistake. It is well to keep in mind that one should never force a line or "class up." If in doubt, put the fleece down, thus improving the top line by the *absence* of the particular fleece in question, and also improving the next line by the *inclusion* of the fleece referred to. So right through the clip from top fleeces down to locks.

In small clips the amount of wool available in a certain line should be either ascertained or carefully estimated, this with the idea of pressing so as to get five bales or more where that is possible, thus avoiding "Star" lots.

NOTICE TO SUBSCRIBERS.
SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

SILOS AND SILAGE.

By G. B. BROOKS, Director of Agriculture.

THE experiences of dairy farmers during the recent dry spell have convinced them of the necessity of having a store of fodder available for feeding to stock in periods of fodder shortage, both to maintain the milk supply and to save animals from death through starvation.

The welfare of the dairyman and the dairying industry generally demands that fodder should be conserved, not only for periods of severe drought but also for feeding to dairy stock as a supplementary ration during the off season, when the natural pastures have lost much of their feeding value.

Fodder, to be conserved in the form of silage, need not necessarily necessitate a large capital outlay for the construction of concrete structures, although the latter are to be preferred where their erection is practicable.

The growing of a crop of succulent material and the preservation of such for an extended period in a condition palatable to stock is an operation that can be carried out by a farmer without previous experience in silage-making.

Successful silage production really consists in, first of all, expelling the air entangled in the green material, and then its exclusion, and the more complete the exclusion the more perfect is the silage.

There are two methods in vogue for attaining this objective. One is to stack the green crop in the open and to apply the necessary pressure to consolidate it into a solid airtight mass, and the other is to conserve it in an airtight compartment or container.

STACK STORAGE.

This has generally been looked upon as being a simple and the least costly method of storing material in a succulent state. The main drawback to the stack is the large amount of wastage that takes place through exposure to the atmosphere, while the raising of the bulky green material over the framework also takes up a good deal of time.

Full particulars in regard to the erection of framework and lifting equipment are detailed in a pamphlet on stack silage procurable from the Department of Agriculture and Stock, Brisbane.

PIT SILO.

This silo has several features to commend it. It can, for instance, be located in a hayshed and floored over, or it can be out in the open and protected by a roof. It will be found invariably that the cost of excavating a pit, if labour is allowed for, will be just as expensive as a concrete structure. The top portion at least will have to be bricked or concreted, and, should the subsoil be unsuitable to provide reasonably smooth sides, this will have to be continued to the whole depth. It is advisable to raise the silo over ground level to the extent of several feet either by a brick or concrete wall, which will increase the capacity and also be a protection against straying stock. To obviate the necessity of raising the cutter, a door can be left in a convenient position for filling. A feature of considerable importance in a pit is that it can be easily filled with chaffed material, the equipment necessary being much less expensive than that required for an overground structure.

In the event of an ordinary chaffcutter being used, it is suggested that the crop grown be either sorghum, sudan, or one of the panicum family. The heavy maize stalks are liable to smash up the usual type of farm chaffcutter. A 2-h.p. engine will generally be found to give sufficient power for chaffing material to fill a pit.

When filling is completed a heavy layer of green grass or lucerne should be spread over the surface and well trodden down. Heating invariably commences in the centre, causing rapid sinking; consequently a few minutes should be spent every other day for, say, a fortnight after filling in treading it down against the walls in order to prevent the access of air.

OVERGROUND SILOS.

In countries where it is the general practice to conserve green material in the form of silage concrete is looked upon as being the most serviceable material for the erection of a silo. A concrete silo is fire, ant, and acid proof, and is, moreover, practically everlasting.

In regard to cost: This depends very largely upon circumstances, such as the distance sand and gravel have to be transported and whether skilled labour would be employed in the construction. If let by contract the cost would probably be in the

neighbourhood of thirty shillings per ton. Plans and specifications of various sizes of concrete silos are available on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The expense entailed in providing equipment for the filling of overground silos, more particularly those of 100 tons and over capacity, is fairly considerable. An ensilage cutter with either a blower or elevator attachment is really a necessity if large quantities of material have to be handled. To operate this machine, at least a 5-h.p. engine would be required. An ordinary farm chaffcutter, to which an elevator has been attached by a link-belt chain, is sometimes used for chaffing ensilage; but in handling, say, a heavy crop of maize, it is likely to prove an endless source of trouble.

SILO CONSTRUCTION.

Galvanised Iron.

Silos built of galvanised iron have not been a success. The acids not only destroy the iron, but variation in temperature detrimentally affects the ensilage adjacent to the walls, causing mould.

Fibro-Cement.

Silos constructed of fibro-cement sheeting attached to heavy studding in octagonal form have, on the whole, been found satisfactory. Care, however, has to be exercised in the use of forks in handling the material inside the silo.

The capacity of a circular silo 14 feet in diameter and 24 feet high would be approximately 60 tons. A 16 feet by 30 feet silo would hold approximately 130 tons.

Silo Moulds.

The Department of Agriculture and Stock has a number of moulds for use in the erection of circular reinforced concrete silos. These moulds, which are of three sizes—viz., 14 feet, 15 feet, and 17 feet diameter, respectively—are loaned to farmers for silo construction free of charge, but on condition that the borrower pays all transport charges on both forward and return journeys between the Department's store in Brisbane and the site where the silo is to be erected. The borrower also is required to give an undertaking that the moulds will be returned in good order and condition and free from any adhering film of cement as soon as possible after the job is completed.

SILAGE CROPS.

In the selection of a crop suitable for silage it will be found that there is a large variety to choose from. Maize is probably the most popular, producing a heavy yield of material and giving good-quality silage. As an all-round crop suitable to wide variations in soil and climate sorghum is outstanding. Although its feeding value is slightly lower than that of maize, its cropping qualities are bettered by some 5 tons per acre. The yield of maize or sorghum varies from 15 to 30 tons per acre, according to the conditions under which they are grown.

By using a maize binder the cost of handling those crops can be very materially reduced than if harvested either by hand or slide cutter.

Sudan grass, panicums, and millets are most useful crops for silage, more particularly when a wheat binder is available for harvesting. The approximate yields that may be expected from those crops are—Sudan and White Panicum, 12 tons; Common Panicum, 10 tons; and Japanese Millet, 9 tons per acre.

COMMON CAUSES OF SECOND-GRADE CREAM.

Of the various causes of second-grade and "border-line" cream there is none so common as the contamination resulting from inefficient washing of dairying utensils. Such contamination may result from—

Failing to wash up twice daily. Washing up with cold water, either once or twice per day. Leaving the separator unwashed at night. Failing to use washing soda to remove grease from utensils. Using objectionable cloths or unclean brushes for washing up. Failing to scald thoroughly all utensils, brushes, &c., after washing. Failing to wash and scald cans on their return from the factory. Washing up utensils in polluted water—rainwater is always preferable.

There are many other ways, of course, in which the dairy farmer, sometimes unwittingly, may jeopardise the quality of his product.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of The Jersey Cattle Society, The Australian Illawarra Shorthorn Society, and The Friesian Cattle Society, production charts for which were completed during the month of October, 1932 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
	JERSEY.	Lb.	Lb.	
	MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.			
Glenview May	F. P. Fowler and Sons, Coalstoun Lakes	6,469·5	399·791	Carlyle Larkspur 2nd Empire
Seycombe Mavis	A. E. Trigger, Didcot	5,944·5	372·097	Oxford Northwood King
Golden Devon Lassie 5th	F. P. Fowler and Sons, Coalstoun Lakes	5,708·4	364·336	Oaklands King Bee
	SENIOR, 4 YEARS OLD (BETWEEN 4½ AND 5 YEARS), STANDARD 330 LB.			
Upwell Miss North	A. E. Trigger, Didcot	5,928·35	371·702	Oxford Northwood King
	JUNIOR, 4 YEARS OLD (BETWEEN 4 AND 4½ YEARS) STANDARD 310 LB.			
Pearlie of Brook Lodge	H. T. Mayers, Nambour	6,858·49	404·275	Butterboy of Brooklodge
	SENIOR, 3 YEARS OLD (BETWEEN 3½ AND 4 YEARS), STANDARD 290 LB.			
Pansy of Billabong	J. Mollenhauer, Moffatdale	5,637·93	362·093	Premier of Calton
Marjorie 2nd of Newhills	J. Nicol Robinson, Maleny	6,394·45	342·335	Prince Harry of Newhills
	JUNIOR, 3 YEARS OLD (BETWEEN 3 AND 3½ YEARS), STANDARD 270 LB.			
Coronada (247 days)	J. Sinnamon, Moggill	6,107·16	341·481	Wonderful Volunteer
Rosevale Lady Nancy	H. F. Rowe, Kenilworth	5,838·4	328·736	Prince Victor of Banyule
Creamy's Empress of Inverlaw	R. J. Crawford, Inverlaw	6,548·7	326·649	Linda 4th's Millstream 4th
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Pineview Duchess	Hunter and Sons, Borallon	5,611·25	336·597	Oxford Buttercups Noble
Glenview Alfriston Una	F. P. Fowler and Sons, Coalstoun Lakes	4,824·75	305·977	Glenview Alfriston Duke
Newhills Crocus Bud	J. Nicol Robinson, Maleny	4,617·3	271·049	Prince Harry of Newhills
Rosevale Foxlove	H. F. Rowe, Kenilworth	4,890·1	265·889	Burnside Hercules
Molly of Burnleigh	W. W. Mallett, Nambour	4,543·5	265·566	Gold Top of Burnleigh
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
Tottie IV. of Golelea	E. M. Franklin, Wonglepong	6,866·15	269·32	Limelight of Raleigh
College Marie	Queensland Agricultural High School and College, Gatton	7,407·78	262·336	College Heir
Wandegong Daisy	G. D. Lindenmayer, Mundubbera	6,660·5	260·136	Emperor of Spurfield
	FRIESIAN.			
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Oaklands Holly 5th	W. Richters, Tingoora	7,669·33	292·866	Pied Rock

Answers to Correspondents.

BOTANY.

Selected from the outward correspondence of the Government Botanist, Mr. Cyril White, F.L.S.

Hexham Scent.

R.C.B. (Chinchilla)—

The specimen is *Melilotus parviflora*, the Melilot or Hexham Scent common as a naturalised weed in Queensland. It is sometimes known as Yellow Lucerne. It has some value as a fodder, especially in localities where ordinary lucerne and clovers will not thrive. It is, however, of annual duration and dies out with the approach of hot weather. This plant was boomed some years ago as a fodder under the name of King Island Melilot, but has never taken on to any extent, probably owing to the fact that the plant taints milk and butter rather badly with its peculiar strong odour. Stock seem rather fond of the plant when it is going off, but as far as our experience goes they do not seem to care for it very much in its younger and more luxuriant stages.

Stink Grass.

J.H.McC. (Hughenden)—

The specimen is *Eragrostis cilianensis*, the Stink Grass, a grass with a very wide distribution over the warm regions of the world. It is naturalised in Queensland and New South Wales, and has been established for many years. It is generally regarded as of little or no fodder value. In Southern Queensland it mostly grows as a weed of cultivation, along railway lines, in waste places, or, in fact, anywhere where the ground has been disturbed.

Milk Tainting Weeds.

T.D.B. (Brigalow)—

1. *Sisymbrium orientale*, the Tumbling Mustard or Oriental Rocket, a common weed in cultivation and a bad weed to taint milk.
2. *Lepidium ruderale*, Pepper Cress, an exceedingly bad weed to taint milk, very abundant in Queensland in cultivation and in pasture lands.
3. *Rapistrum rugosum*, Giant Mustard or Turnip Weed, a very bad weed to taint milk.

All three plants belong to the Mustard family, Cruciferæ, and are common plants, widely spread over the warm temperate regions of the world as farm weeds.

Mustard Tree.

C.H.W. (Pittsworth)—

The specimen is not Needlewood, but *Apophyllum anomalum*, commonly called Mustard Tree. In spite of its wiry branches, it seems to be quite readily eaten by stock and is said to be rather a valuable fodder. It does not grow to any great size, and we do not know that the wood has any particular value.

Prairie Grass.

N.Z. (Gradule)—

The specimen is the Prairie Grass, *Bromus unioloides*. It is an annual grass, but is one of the best winter fodders in Queensland. Seed is obtainable through the ordinary commercial channels. Seed should be sown in the autumn, and is commonly sown along with clover, about 20 lb. of prairie grass and about 10 lb. of clover seed to the acre.

Tie Bush.

V.R. (North Arm)—

The specimen is *Wickstroemia indica*, sometimes known as Tie Bush. The local name refers to the fibrous nature of the bark. This shrub has been accused of poisoning stock on various occasions and has rather an evil reputation among stock owners. A few years ago feeding experiments were conducted at the Animal Health Station, Yeerongpilly. At the end of the experiment the animals were emaciated, and during the course of feeding they developed diarrhoea and passed a certain amount of blood with the faeces. They recovered, however, when put on to normal feed again, and we should say they certainly ate more of the shrub than they would have under natural conditions.

Milk Tainting Weeds (Pepper Cress, Wild Carrot, Fish Weed, Stagger Weed, Indigo, Snuff Weed).

A.A. (Gatton)—

The specimens have been determined as follows:—

1 and 2. Both forms of *Lepidium ruderale* (Pepper Cress). One of the worst milk-tainting weeds we possess.

3. *Apium leptophyllum*, generally called Wild Carrot, though this name more correctly belongs to an allied plant, *Daucus brachiatus*. Both are bad milk-tainting weeds.

4. *Senebiera didyma* (Bitter Cress or Wart Cress). An exceedingly bad milk-tainting weed.

5. *Chenopodium triangulare* (Fish Weed). As the name suggests, this plant gives a somewhat fishy flavour and odour to milk and cream. It is quite a useful fodder, but has bad tainting properties.

6. *Stachys arvensis* (Stagger Weed or Wild Mint). This plant causes staggers or shivers in working stock, but ordinary resting paddock stock seem to be quite unaffected by it; in fact, it is generally looked upon by dairymen as a useful fodder. We do not know the extent to which it would taint milk, but like a great many of these herbaceous plants it would probably give a somewhat weedy flavour.

7. *Indigofera australis*, a species of Indigo very common in the Lockyer Valley. It has been suspected of being poisonous to stock, but feeding tests have always given negative results.

8. *Centipeda orbicularis*, sometimes called Snuff Weed. We should say this weed would taint milk badly, but doubt if stock would eat it in anything but very minute quantities.

Wild Mint.

E.W.C. (Gympie)—

The specimen is the Wild Mint or Narrow-leaved Sage, *Salvia lanceifolia*, a native of North America, which has appeared as a weed in the Pittsworth district, and is now gradually spreading to other parts of the State. This plant was responsible for serious losses in travelling stock some little time ago, and feeding tests have since proved it to be very poisonous. Its immediate eradication is, therefore, recommended.

Groundsel.

S.K.K. (Pomona)—

The specimen is *Baccharis halimifolia*, the Groundsel Bush, a native of South America, now a common naturalised weed and a great pest in several localities in Queensland. It has been accused of poisoning stock, but feeding tests carried out some years ago at the Animal Health Station, Yeerongpilly, gave negative results. After about a fortnight's feeding on the plant the animals were merely very emaciated, thus proving that though the plant may not actually be poisonous it has no fodder value whatsoever. If your loss of cows was due to vegetable poisoning, we should say some plant other than the Baccharis was the cause of the trouble.

Points in Pig Feeding.

E.J.C. (Caboolture)—

Tomatoes, cucumbers, and pineapples are all foods which may be used to advantage in the feeding of pigs, but, of course, their commercial value usually means that they are too expensive to be classed as profitable pig foods, and when their value is reduced by bruising, damage, and decay, their food value is also reduced, and they become risky, and sometimes even poisonous. Most fruits carry less food value when unripe than when fully matured, and this refers to tomatoes as well as others, though there is no actual danger of poisoning in feeding green tomatoes, provided, of course, they are fed in conjunction with other more concentrated feeding stuffs, like pollard, and barley meal. From the point of view of checking diseases and parasites, most fruits are better fed in a cooked form, this referring to unripe fruit also.

General Notes.

Staff Changes and Appointments.

Department of Agriculture and Stock,
Brisbane, 3rd November, 1932.

Mr. John Smith, general manager of the Farleigh sugar mill has been appointed millowners' representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. D. L. McBryde, resigned.

Mr. R. S. Sigley, Dairy Inspector, Crow's Nest, has been transferred to Cooroy, and Mr. D. F. Keith, Dairy Inspector, from Cooroy to Crow's Nest.

A rearrangement of the headquarters of a number of stock inspectors has been made in the Department of Agriculture and Stock; and, in future, the following officers will be stationed at the places mentioned:—

J. B. Cardno	Winton.
J. P. Dowling	Gayndah.
D. Culhane	Toogoolawah.
A. G. Smyrell	Bowen.
W. J. Sheahan	Clermont.
S. C. O. Jessop	Toowoomba.
J. J. Shelvey	Helidon.
H. A. McDonald	Jandowae.
J. Wyvill	Helidon.
S. B. Myles	Kingaroy.
C. P. Joyner	Kingaroy.

Mr. E. Broughton, Elimbah, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Mr. A. F. Uhlmann has been appointed an Honorary Ranger under the Animals and Birds Acts, in respect of the Kipper Ring Lagoons, near Redcliffe.

Grade Standard for Plums.

A Regulation has been issued under the Fruit and Vegetables Act, providing for a grade standard for plums marketed in Queensland.

The Regulation provides that no variety of plum shall be sold in the State of a lesser diameter than the minimum prescribed for the undermentioned varieties:—

1⅜ inch.	1½ inch.
Little Gem	Burbank
Evans's Early	Giant Prune
Blue Rock	Pond's
Tibbits	President
Early Orleans	Grand Duke
	Black Diamond
	Magnum Bonum
	Coe's Golden Drop
1¼ inch.	Kelsey
Doris	Wickson
Duffy's	Ballina
Wright's Early	Shiro
Santa Rosa	Beauty
Wilson	Formosa
Angelina Burdett	Sultan
	October Purple

Brumbies on Beerburrum Settlement.

A Proclamation has been issued declaring the Parishes of Beerwah and Canning, situated in the Brisbane Stock District, to be a district for the control of "brumbies" or wild horses for the period from 1st December, 1932, to 31st March, 1933.

The Beerburrum Tobacco Settlement is embraced in the abovementioned parishes, and numbers of horses which have been running wild in the scrub have been causing much concern to the settlers in the district. Action can now be taken during the period specified above to rid the settlement of trouble from straying stock.

Rural Topics.

Butter Fat Content of Milk.

The butter fat content of the first and subsequent deliveries of milk drawn from a cow varies considerably as will be noted from an analysis of the milk from three cows as tabulated hereunder:—

—	Cow No. 1 Fat Per Cent.	Cow No. 2 Fat Per Cent.	Cow No. 3 Fat Per Cent.
First portion	0·90	1·60	1·60
Second portion	2·60	3·20	3·25
Third portion	5·35	4·10	5·00
Fourth portion (strippings)	9·80	8·10	8·30

Weights of Bacon Pigs.

The following simple method of estimating the approximate dressed weight of pork and bacon pigs when the actual live weight is known is worth noting. Assuming that the actual live weight of a prime quality bacon pig is 170 lb., and that it is desired to estimate the dressed weight, as is done in Queensland in the purchase of pigs by the proprietary bacon factories—

Actual live weight, 170 lb.

Deduction between live weight and dressed weight averages about 30 per cent. Multiply the actual weight (170 lb.) by 7. From the result (1,190) cancel the nought, or last figure, and the remaining figures (in this case 119) will represent the approximate dressed weight in pounds.

Thus, a pig weighing 170 lb. alive is estimated to dress out at 119 or 120 lb. This may not be actually correct, but it is a good estimate that for practical purposes will be found to fill the bill and prevent undue errors in marketing, as 30 per cent. off is a general deduction, allowing both for the actual loss in offal at slaughter and shrinkage in transit between farm and factory. The actual loss is heavier in light-weight pigs and lighter in the heavier weights.

To Prevent Calves Sucking Each Other.

When calves are fed in separate pens, do not release them until the taste of the milk ration has left the mouth. When calves are four weeks old they should be given a small ration, such as bran or ground meals, in a dry state in a trough, so as to be available as soon as they have finished their liquid ration. They will be occupied in consuming the dry ration until the taste of the milk has left their mouths and will start picking the pasturage. The calves should at all times have access to a clean supply of drinking water. Do not allow calves to run with heifers, as the calves sucking the udder may cause udder troubles when the heifer freshens.

A Lonely Bush Grave.

In answer to a correspondent seeking the history of a lonely, but well-tended grave, near Dalby, Mr. J. Shaw Thompson, editor and proprietor of the "Dalby Herald," has courteously given us the following information:—

In regard to the grave at the foot of the Bunya Mountains, this is known as "Gertrude's Grave." It is fenced and has a headstone engraved: "Maria Gertrude Carbines, 15/5/1840-17/5/1866," and on the reverse: "This hallowed spot is Gertrude's Grave." This pioneer woman died in childbirth while her husband was on his way to Dalby for medical assistance. The grave was regularly attended and the fence painted, up to 1914, by someone, presumably the husband. After that, the grass grew over the grave and the fence fell into disrepair, and whoever had been tending the grave (and no one knows whom) had either died or removed very far away. In 1923 attention was drawn to the neglected grave by Mr. Abraham Hertzberg, who visited the mountains that year; and, as a result, the grave was restored and an iron fence erected by the people of Dalby, and the grave is now regularly looked after.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

INFANTILE DIARRHŒA.

It is not many years since large numbers of babies in Queensland died every year from diarrhœal diseases. During the years 1890 to 1903 every tenth baby born died before reaching its first birthday (from all causes). During the past five years this mortality has been reduced to much below one in twenty. On our annual birth rate, which is not far from 20,000, this has meant the saving of more than 1,000 lives every year, which is surely a remarkable fact. Diarrhœal diseases, often occurring in formidable epidemics in summer months, were the largest cause of the former high death rate. Infectious diarrhœa now causes few deaths, but, like a snake in the grass, it is still venomous.

Our Best Defence.

Against this our best defence, and our only hope for reducing deaths from diarrhœa to a minimum, is a clear understanding of its causation. Unfortunately, there has been no subject on which more obscurity, more confused thinking, more foolish traditions and absurd beliefs have been prevalent. All these have been a direct cause of the high mortality. Until recently nearly every mother when asked the cause of her baby's illness, would reply, as a matter of course, "teething," and many think so still, though it is nonsense. This deadly nonsense has been the cause of innumerable infant deaths. Teething never killed anybody. Recently some mothers will tell us that the cause is "gastro-enteritis," or as they call it for short, "gastritis." Unfortunately these are but names. They convey no knowledge, but hide much ignorance. They are just big words, which send the mind to sleep.

Let us try to make this matter so clear that even the simplest, if they will only attend, can understand. Diarrhœa is the passage of frequent loose or watery motions. It is caused by the presence of some irritating material in the bowels. The bowels are trying to expel this, and so the motions are frequent. The contents of the bowel are being hurried through, and so they are watery. All sorts of things will cause diarrhœa in babies, but we may divide them into two classes.

Food Diarrhœas.

These may occur in artificially fed babies at any time, but are more frequent during hot weather. The baby is given unsuitable food or more food than he can digest, so that the excess ferments inside. Sometimes the system of feeding is wrong. Sometimes his mother is feeding him carefully, but kind friends give him things he ought not to have. If he has learnt to crawl, he may have picked up some rubbish and swallowed it. Perhaps he is being given cow's milk which is stale or dirty and rapidly becomes irritating in hot weather. Perhaps he has been very thirsty on a hot day, and his mother, instead of giving him water, has given him too much milk. Perhaps he has had a feverish illness, and his mother has

kept him on full diet instead of giving him more water and less food. All these things cause diarrhœa. The treatment is very simple. Give him a teaspoonful of castor oil to help to clear out the irritating material. Give him no milk and stop all food, but let him drink plenty of very weak barley water. Keep him on this one, two or three days. When he improves give him scalded whey made from junket. If over eight or nine months he may also have arrowroot, cornflour, or sago boiled with water, and if really hungry a small finger of baked bread. When his motions get right, add milk to his food gradually. So treated, most cases of food-diarrhœa get well rapidly. Only long-standing and neglected cases are obstinate and sometimes waste and die.

Infectious Diarrhœas.

These occur especially in the early summer, and are a much more serious matter. Your baby has swallowed disease germs, living bacteria, which are the cause of his illness. Often the attack begins suddenly with high fever and much weakness. Often it begins gradually, so that you may think it a simple food-diarrhœa, but in spite of castor oil and barley water you find baby is no better next day, but worse. Medical treatment is urgently necessary in all these cases, and you should see a doctor at once.

But the responsibility for preventing these illnesses, for keeping germs from getting inside the baby, rests with his mother. If the baby is on the breast he runs very little risk with ordinary care. If he is bottle-fed you must take the greatest care. Do not blame the milkman. Boiling or pasteurising kills all disease germs. Therefore the germs must have got into the milk after boiling or pasteurising. They were carried there by flies or by the mothers fingers, and they can be carried into foods made from dried or condensed milk just as easily. The flies may have deposited the germs on the rubber teats, or on the dummy, which you know the baby ought not to have. Constant care and watchfulness are the baby's safeguards. If you do not know how to keep the baby's food safe from infection, the nurse at the baby clinic will show you. Do not wait until your baby is sick, for then it may be too late.

Orchard Notes for January.

THE COASTAL DISTRICTS.

ALL orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may

also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be grown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

CLIMATOLOGICAL TABLE—OCTOBER, 1932.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·96	87	74	91	23, 24	68	26	Nil	..
Herberton	..	85	59	95	22–24	52	6	110	3
Rockhampton	29·98	87	66	99	23	60	22	122	8
Brisbane	30·02	78	60	86	14	52	10	297	11
Darling Downs.									
Dalby	29·99	79	54	86	5	40	10	292	13
Stanthorpe	..	71	46	78	5, 31	33	10, 20	248	14
Toowoomba	..	73	51	82	5	39	10	262	12
Mid-interior.									
Georgetown	29·89	98	70	106	24	62	7	11	3
Longreach	29·91	94	63	104	22	53	21	46	3
Mitchell	29·95	85	53	97	22	37	21	49	2
Western.									
Burketown	29·92	96	71	103	23	62	3	38	2
Boulia	29·92	93	58	108	24	49	3	37	2
Thargomindah	29·96	83	58	99	30	43	21	2	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING OCTOBER, 1932 AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Oct.	No. of Years' Records.	Total Rainfall. Oct., 1932.	Oct., 1931.
North Coast.	In.		In.	In.
Atherton	0·91	31	0·46	1·11
Cairns	2·15	50	0·49	5·23
Cardwell	2·07	60	1·15	3·40
Cooktown	1·07	56	0	0·15
Herberton	0·97	46	1·10	0·57
Ingham	1·96	40	0·52	3·35
Innisfail	3·02	51	0·69	4·57
Mossman Mill ..	3·17	19	0·77	4·46
Townsville	1·41	61	0·10	3·68
Central Coast.				
Ayr	1·00	45	0	1·09
Bowen	1·05	61	0	0·82
Charters Towers ..	0·69	60	0·60	1·01
Mackay	1·69	61	0·21	1·18
Proserpine	1·74	29	0·08	0·90
St. Lawrence ..	1·73	61	1·58	0·24
South Coast.				
Biggenden	2·19	83	4·37	2·53
Bundaberg	1·97	49	6·28	1·47
Brisbane	2·54	81	2·97	0·58
Caboolture	2·47	45	3·01	0·89
Childers	2·47	37	5·17	2·26
Crohamhurst ..	3·25	39	2·45	1·61
Esk	2·50	45	4·74	1·17
Gayndah	2·34	61	3·59	2·38
Gympie	2·67	62	3·09	1·48
Kilkivan	2·58	53	3·48	0·65
Maryborough ..	2·01	60	5·90	1·28
South Coast—continued—	In.		In.	In.
Nambour	2·91	36	3·34	0·99
Nanango	2·25	50	3·33	0·87
Rockhampton ..	1·75	45	1·22	0·50
Woodford	2·42	45	7·50	0·86
Darling Downs.				
Dalby	2·00	62	2·92	2·39
Emu Vale	2·14	36	3·30	1·00
Jimbour	1·87	44	2·52	1·91
Miles	1·95	47	2·20	1·84
Stanthorpe ..	2·54	59	2·48	2·16
Toowoomba ..	2·55	60	2·62	1·31
Warwick	2·28	67	3·63	1·33
Maranoa.				
Roma	1·73	58	1·11	0·72
State Farms, &c.				
Bungeworgorai ..	1·38	18	0·71	0·82
Gatton College ..	1·99	33	2·60	1·00
Gindie	1·33	33	1·54	0·33
Hermitage ..	1·86	26	..	0·97
Kairi	1·06	18	..	0·88
Mackay Sugar Experiment Station	1·42	35	0·28	0·94

GEORGE E. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1932.		January, 1933.		MOONRISE. Dec., 1932.	MOONRISE. Jan., 1933.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4·51	6·31	5·3	6·47	7·39	9·37
2	4·51	6·31	5·4	6·47	8·44	10·33
3	4·51	6·32	5·4	6·47	9·49	11·27
						p.m.
4	4·52	6·33	5·5	6·48	10·51	12·21
5	4·52	6·33	5·6	6·48	11·47	1·15
					p.m.	
6	4·52	6·34	5·6	6·48	12·41	2·9
7	4·53	6·34	5·7	6·48	1·35	3·5
8	4·53	6·35	5·8	6·49	2·27	4·0
9	4·53	6·35	5·9	6·49	3·23	4·54
10	4·53	6·36	5·10	6·49	4·17	5·47
11	4·54	6·37	5·10	6·49	5·12	6·37
12	4·54	6·37	5·11	6·49	6·7	7·28
13	4·54	6·38	5·12	6·49	7·0	8·3
14	4·54	6·38	5·13	6·49	7·53	8·40
15	4·54	6·39	5·14	6·49	8·41	9·9
16	4·55	6·39	5·15	6·49	9·25	9·40
17	4·55	6·40	5·16	6·48	10·3	10·11
18	4·56	6·41	5·17	6·48	10·35	10·42
19	4·56	6·41	5·18	6·48	11·7	11·18
20	4·57	6·42	5·18	6·48	11·39	12·0
					a.m.	a.m.
21	4·57	6·43	5·19	6·47	..	12·49
22	4·58	6·43	5·20	6·47	12·10	1·48
23	4·58	6·44	5·21	6·47	12·45	2·52
24	4·59	6·44	5·21	6·47	1·21	3·59
25	4·59	6·45	5·22	6·46	2·7	5·8
26	5·0	6·45	5·23	6·46	3·3	6·15
27	5·0	6·46	5·24	6·46	4·7	7·18
28	5·1	6·46	5·24	6·45	5·14	8·19
29	5·1	6·46	5·25	6·45	6·22	9·14
30	5·2	6·47	5·25	6·44	7·30	10·9
31	5·3	6·47	5·26	6·44	8·36	11·5

Phases of the Moon, Occultations, &c.

5 Dec.	☾ First Quarter	7	45 a.m.
13 ,,	○ Full Moon	12	21 p.m.
21 ,,	☽ Last Quarter	6	22 a.m.
27 ,,	● New Moon	9	22 p.m.

Apogee, 10th December, at 10.12 p.m.
Perigee, 26th December, at 11.36 a.m.

Mars will be passing from west to east of Neptune at 6 p.m. on the 5th at a distance of rather more than 3 diameters of the Moon northward.

Mercury's movements, apparently westward amongst the stars on the border of Orphiucus and Scorpio, will be arrested on the 14th, after which it will proceed steadily eastward in Orphiucus.

The Australian summer Solstice will occur on 22nd December, when the Sun reaches its most southern point, after which it will gradually retire northward for the next six months.

An interesting conjunction of the Moon and Saturn will occur early in the evening of the 29th, when the planet will be 3 degrees northward of the crescent-shaped Moon, about an hour and a-half before they set.

Mercury, in conjunction with the Sun on the 4th, will set 39 minutes after it on the 1st of December at Warwick; on the 15th it will rise at 3.48 a.m., one hour seven minutes before the Sun.

Venus will rise at 2.59 a.m. on the 1st and at 3.1 a.m. on the 15th.

Mars will rise at 12.18 a.m. on the 1st and at 1139. p.m. on the 15th.

Jupiter will rise at 12.53 a.m. on the 1st and at 12.1 a.m. on the 15th.

Saturn will set at 10.15 p.m. on the 1st and at 9.22 p.m. on the 15th.

The Moon's path during December will be in Sagittarius on the 1st, in Capricornus 2nd and 3rd, in Aquarius 4th and 5th, in Pisces 6th, 7th, and 8th, in Aries on the 9th, in Taurus 10th, 11th, 12th, and 13th, in Gemini 14th and 15th, in Cancer 16th and 17th, in Leo 17th, 18th, 19th, and 20th, in Virgo 21st, 22nd, and 23rd, in Libra on the 24th, in Scorpio 25th, in Orphiucus 26th, and again in Sagittarius on the 27th and 28th, in Capricornus on the 29th and 30th, and in Aquarius on the 31st.

Instead of the full Moon on Christmas Day as last year, the evening will be moonless, affording better opportunities for noticing the constellations, including Aquarius, Pisces, Aries, Taurus, Gemini, and Cancer, arching from west to east, somewhat to the north. Another arch from Orion to the Southern Cross will include Sirius and Canopus, the finest fixed stars. The Southern Cross will be below the horizon in Queensland till nearly 10 o'clock.

4 Jan.	☾ First Quarter	2	24 p.m.
12 ,,	○ Full Moon	6	36 p.m.
19 ,,	☽ Last Quarter	4	15 p.m.
26 ,,	● New Moon	9	20 a.m.

Apogee, 7th January, 11.36 a.m.
Perigee, 23rd January, 12.48 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 28 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.